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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Graduate Work

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This study of salient factors pertaining to graduate work in industrial education may be found very helpful by teachers of industrial arts and vocational education.

Although the subject of graduate work in industrial education arises each year with hundreds of individuals, little has been done to establish information to which any general reference might be made. Industrial-arts and vocational-education students all over the country are constantly seeking advice as to which institutions are best fitted to meet their individual needs. In like circumstances are those active in the teaching field of industrial education who desire information leading to studies toward the master's degree.

This article is based on a graduate thesis bearing the title "Salient Factors Pertaining to Graduate Work in Industrial Education." It is the author's desire to present and interpret some of his findings in as helpful a way as possible, to reveal the elements that are a part of graduate study in industrial education in the more popular institutions, and to offer helpful suggestions to those interested in graduate study in industrial education.

Scope of the Study

The group of institutions studied includes all those in the United States having granted two or more graduate degrees to candidates having at least "thesis credit" in industrial education. The study covers 20 states and consists of 41 institutions having granted two or more master's degrees. The study shows the existing status of graduate work in industrial education as revealed by various graduate catalogs for the regular session of 1934–35.

Character of Graduate Work

A graduate course is a highly advanced course designed to promote mastery of a subject through a student's own initiative, and to develop a spirit of originality and independence in research under the guidance of instructors. Training for advanced service in the field of industrial education should be based on a comprehensive and unified grasp of fundamental facts, generalizations, and problems rather than on a series of short separate units or courses. This unified understanding of major problems in industrial education should precede the pursuit of more highly specialized and advanced courses or seminars of a more conventional type. It is generally maintained that mature students, with wide individual differences in experience, training, and ability, are not able to acquire a comprehensive mastery of the field of industrial education, and independence of thought and judgment, through separate short courses which often lack articulation and synthesis.

Extent of Courses Offered

In graduate work, the institution does not prescribe the field or fields in which a student must pursue his studies. Ordinarily, any group of subjects in the field of industrial education is considered proper and appropriate if the material is of recognized graduate standing and has a basic or related field unity. The selection of courses and a program of study is usually made in conference or after conference with authorities in the department of industrial education and with their approval.

It is evident that at least three types of courses are offered on the graduate level at most institutions. The *first* class is strictly "open to graduates," and ordinarily the student must select industrial-education courses from this classification for major credit. The *second* class is "open to graduates and advanced undergraduates," and consists of courses usually accepted for minor credit only. In all cases where laboratory or shop courses are offered in the graduate school, they are offered in this classification. Some institutions studied, offer most of their graduate courses in industrial education on this level, and in nearly every case the graduate student is expected to do a greater amount of work and of a higher quality than that required for undergraduates. However, no data are available on the extent to which this is actually carried out. The *third* class consists of courses which may be taken by graduate students for "supporting" credit. This class of instruction does not ordinarily allow credit in either major or minor subjects toward an advanced degree. If the student's undergraduate work is not sufficient preparation for advanced study in industrial education, he will be assigned to such undergraduate courses as may best correct the deficiency.

Institutions offering many courses in industrial education on the graduate level, as revealed by graduate catalogs, are:

California, University of
Colorado State Teachers College
Columbia University — Teachers College
George Peabody College for Teachers
Indiana University
Iowa State College
Kansas State Teachers College
Minnesota, University of
New York University
Ohio State University
Oregon State Agricultural College
Pennsylvania State College
Rutgers University
Tennessee, University of
Texas, Agricultural and Mechanical College of

Admission

In all institutions investigated, admission to the graduate school is ordinarily granted to holders of a bachelor's degree from any of the colleges of the university of which the graduate school

is a part. In addition, admission is ordinarily granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent, and to graduates of other universities and colleges of recognized standing who are qualified to pursue with profit the advanced courses of study in industrial education. By colleges of "recognized standing" most graduate schools refer to those colleges on the most recent lists of accrediting agencies. In no case does admission to the graduate school necessarily imply admission to candidacy.

Additional requirements depend upon such factors as the amount of the student's undergraduate preparation in industrial education, the character of his undergraduate work, and the nature of the course which he elects to pursue. Conditions observed by most graduate schools in admitting industrial-education graduates from institutions not on the approved lists are numerous and individually complex. The author believes that the work of the graduate school would indeed be facilitated if all prospective graduate students would present a clear statement of their objectives before registration, for, no doubt, many graduate students have very vague ideas as to their program even after admission.

The procedure to apply for and obtain admission to graduate schools varies considerably. The date for filing application for admission is specifically stated by some institutions, and for others it may be any time prior to the opening date of registration. In nearly all cases, application must be accompanied by an official transcript of the applicant's entire undergraduate record.

Tuition and Fees

The number and amount of fees which graduate students must pay differ widely in various graduate institutions. There are certain fees which must be paid unless otherwise exempt. An overview of the following fees for the master's degree is indeed interesting:

Matriculation fee
Registration fee
Reregistration fee
Changes in registration fee
Late registration fee
Late classification fee
Tuition, resident
Tuition, nonresident
Tuition, per point or credit
Tuition, per quarter (3)
Tuition, per semester (2)
Tuition, late-payment fee
Laboratory fees and deposits
Graduation and diploma fee
Degree-in-absentia fee
Work-in-absentia fee
Medical-attention fee
Special-examination fee
Transcript or certificate fee
Library fee
Thesis fee (general)
Thesis-binding fee
Thesis-publication fee
Thesis-abstract-publication fee
Listener's or auditor's fee
Incidental or general fee
Student-activities fee
Student-association fee
Union or "club" fee
Miscellaneous fees

To illustrate the wide diversity in fees, a few outstanding examples follow: Matriculation fees vary from $1 to $25 a semester; tuition for residents varies from no charge to $150 a year; tuition for nonresidents varies from no charge to $220 a year; tuition per quarter (3 terms per year) varies from $5 to $100; tuition per semester (2 terms per year) varies from $10 to $150; graduation or diploma fees vary from no charge to $25, and incidental or general fees vary from $6 to $100 a year.

Resident Requirements

The resident status of graduate students is a matter of considerable importance. This is true because in most institutions this, and this alone, is the basis for determining the length of time a student must attend the particular graduate school to satisfy minimum requirements for the advanced degree. Factors taken into consideration in determining the resident status vary notably with institutions. In general, all institutions are found to agree on one academic year of residence (on-campus credit) or "its equivalent" to fulfill requirements for the master's degree.

Optional summer requirements for the master's degree also vary greatly. Summer sessions range from three weeks to twelve weeks. The six-week session appears to be, by far, the most popular. In eighteen schools, all work to be counted for the master's degree, including the thesis and final examination, must be completed within definite time limits. These limits vary from two to six years, the most common being five- and six-year limits. Credits earned outside this resident time limit may be used only as foundation work, and may not be counted toward the master's degree.

Nature of Credit Distribution

The satisfaction of any given time or credit requirement, taken alone, does not confer upon the candidate a right to any advanced academic degree. While in every case, the program of studies must be satisfactory and must receive the approval of proper authorities, the achievement of the candidate is usually held to depend, in a large measure, upon his actual scholarly development. The attainment of the master's degree is usually based on the completion of a specified number of required or elective credits, together with a specific number of grade points computed on credits so offered.

In all graduate work, the candidate chooses a major subject (sometimes two) and one or two minor subjects. A great diversity in the specified number of major and minor credits is indeed significant in the distribution for the master's degree. Usually from one half to two thirds of the total graduate credit is required for the major work. The approval of a program of credits is usually in charge of a special faculty committee or an adviser, and a candidate is expected to confer freely with his adviser or committeemen, both in regard to the general plan of his program and in regard to specific courses of study.

Thesis Requirements

A very important part of the work of a candidate for the master's degree in industrial education is the preparation of a satisfactory thesis; or if policies permit having it waived, substituting additional credits which are usually required. However, this practice is not common. The thesis is not ordinarily identical to any regular course, though it may be closely related to a research course. A thesis is usually supervised throughout its preparation by a committee, an adviser, or the department head.

It is not the intention of any of the institutions studied, to require that the master's thesis shall be a highly recondite research, such as befits candidacy for the doctorate; but rather, it must be a serious, considerable, and printable piece of work, demonstrating the writer's power of original thought, his thorough grasp of industrial education, and his ability to present his material in a scholarly manner and style.

Practice varies greatly in regard to the credit granted for the master's thesis, ranging from 7 per cent to 40 per cent of the total graduate credit. The number of final copies required, varies from one copy to four copies of the thesis proper, and from none to six copies of an abstract of the thesis.

Admission to Candidacy

Admission to courses in the graduate school does not necessarily mean that a student will become a candidate for an advanced degree. Admission to candidacy is usually a separate step from admission to the graduate school. Admission to candidacy signifies that a student has, through resident work at that particular graduate school, demonstrated the thoroughness of his previous preparation and his fitness to proceed to do work of good graduate character. A new student, therefore, is usually asked not to seek admission to candidacy until authorities have had ample opportunity to observe him.

Formal admission to candidacy is usually initiated by the written petition of the student upon a uniform blank furnished by the graduate school for this purpose. This petition, properly endorsed by necessary authorities, is usually presented to the graduate dean and remains the property of his office. This formal application requests that the student comply with certain regulations concerning dates, qualifying examinations, submission of credentials, and an approved thesis topic. Candidacy regulations and requests show great diversity among graduate institutions. Graduate catalogs reviewed, show unanimously that no student can be considered active in candidacy for an advanced academic degree unless he is properly registered in the graduate school. Students are required to register at the beginning of each term whether pursuing a course of study (full or part-time), or writing a thesis or research report.

Library Facilities

It is well for the prospective graduate student to become familiar with the library of the institution which he is about to enter. The library is one central all-important institution making possible or impossible by its strength or weakness, real graduate work by graduate students and faculty alike. A glance at the library facilities of the various graduate schools will give some idea of the preparation of these schools to offer graduate work. The college library is for effective instruction, for research and investigation, for intellectual growth of students and faculty, and for general reading. Progress, in research especially, depends largely upon a broad background-knowledge of that which has previously been accomplished. Such a background of knowledge is obtained only from a search of the literature in a particular field. The function of the library in its aid to research is to make available these records of the past.

Modern libraries even strive to make available to graduate students such conveniences as typewriters, calculating machines, seminar rooms, and study cubicles or carrells. Cubicles are, in general, for use by graduate students and faculty only, and consist largely of study tables in the bookstacks, placed in close proximity to the collection with which the graduate students work. Seminar rooms, as the name implies, are special meeting places that are in close proximity to library facilities, for seminars of special study groups.

Research Courses and Seminars

In most institutions, courses are offered under the first classification, or strictly graduate level, that are commonly referred to as research courses or special-studies courses, independent of announced courses or seminars. Ordinarily, graduate students will spend part of their time in such courses for special studies or problems in industrial education before being granted an advanced degree.

A graduate seminar is not ordinarily intended as a place for the impartment of knowledge by means of faculty lectures, but as a medium for growth of all concerned (faculty and students) through critical study and co-operative effort. Manifestly, it follows that major responsibility for the growth and participation of the student rests with the individual rather than with the faculty. Evidence of this growth may be had in the form of discussions, problems solved, papers submitted, and comprehensive examinations. The materials to be utilized may be pertinent literature and evidence, current educational activities, and student and staff experiences.

Final Examination

It should be clearly understood that the requirements for a master's degree in any field are not to be measured solely in terms of accumulated credits. A candidate for the master's degree is usually expected to acquire a mastery of the field of industrial education, such as may reasonably be expected of an adequately prepared student who has devoted one academic year of full-time study to the field. A candidate is also expected to have developed a spirit of sound scholarship and powers of independent research. Proficiency in such mastery and development is usually measured by a final examination of some type.

Most of the institutions granting degrees in industrial education require an oral final examination; some written, some oral and written, and some require the oral and the written only when deemed necessary. The final examination is usually held subsequent to the student's formal admission to candidacy for the master's degree, and is administered from several days to several weeks prior to commencement. When a thesis is required of a student, he is ordinarily not admitted to the final examination until his thesis has been accepted and approved.

Why Teach Mechanical Drawing?

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In this article, the author attempts to justify the inclusion of the subject of mechanical drawing in the high-school curriculum.

Among the industrial-arts subjects taught in modern high schools, mechanical drawing is one of the most popular and useful. It is a branch of engineering drawing, and, like any other form of drawing, is really a language which must be learned and used with great accuracy. It tells with straight and curved lines, to an exact scale, the exact shape and appearance of the piece of work that is to be made from it in the shop, or that is to be erected in the field.

Mechanical drawing consists of several forms, and a necessary foundation for them is a knowledge of freehand drawing, and of geometrical drawing, which is acquired in the junior high school. There are many geometrical con-

structions in engineering drawing, and knowing how to use them simplifies what would otherwise be a complicated layout. Freehand sketching is used by the engineer or draftsman in many ways. It is one form of drawing in which notes may be kept for future reference, or a designer may hand a sketch to a draftsman to be developed into a finished drawing. Sketching is constantly used to explain ideas and show forms which would otherwise be difficult to describe in words.

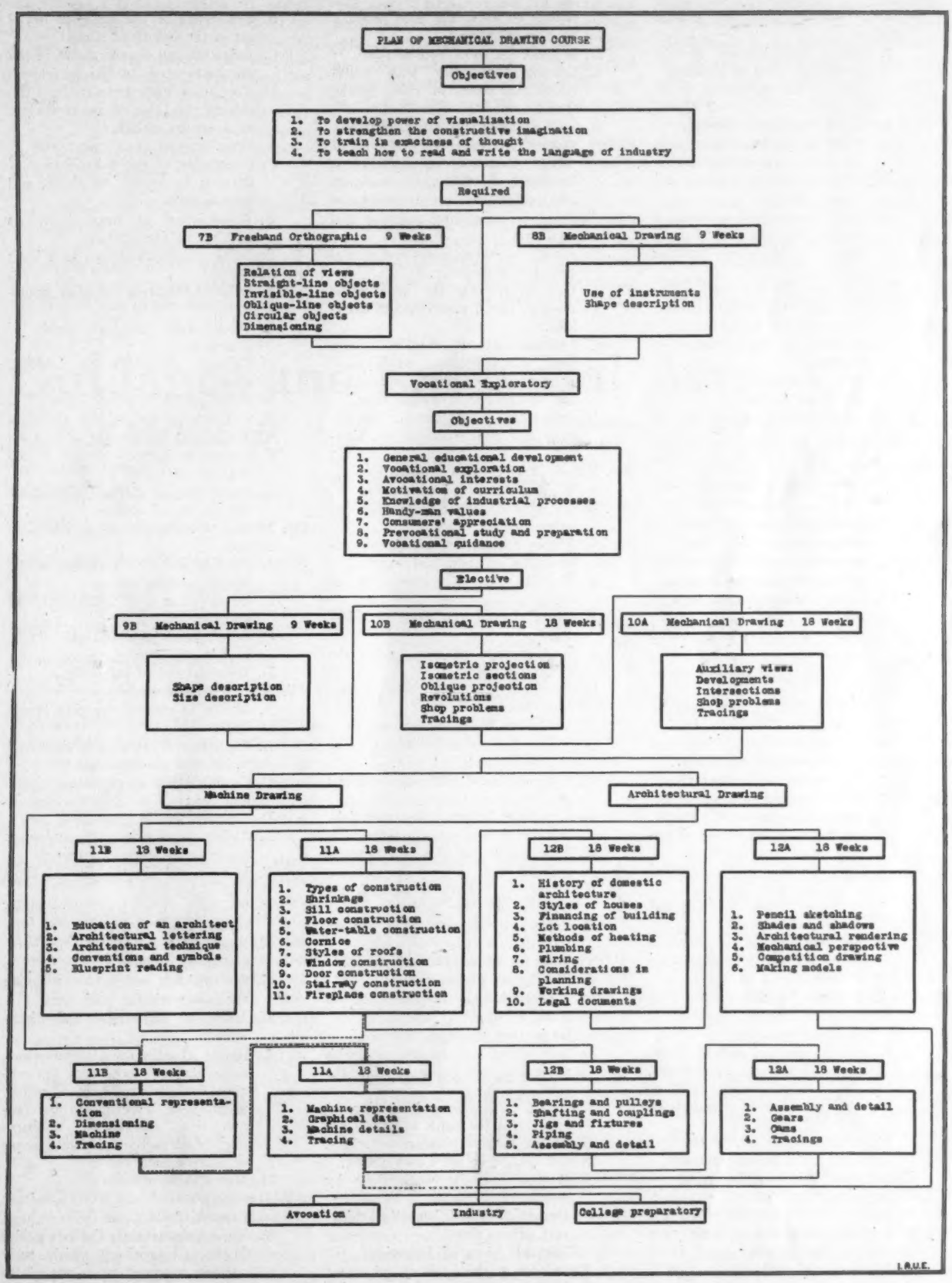
Mechanical drawing is one of the most powerful and exacting means of expression known to man. Words are entirely inadequate to express the beauty of the architect's conception of a cathedral, yet his drawing expresses it so well that the craftsman can and does make it into a reality. Wonderful ideas, dreams, and visions are being expressed every day by means of mechanical drawing. The radio, skyscraper, automobile, and the airplane are only a few things men have seen in their imagination and then brought into reality through the medium of mechanical drawing. It is impossible to mention an industry of today in which drawing does not play an important part. Everyone is familiar with the uses of drawing in building design and construction and its great importance in the design and manufacture of machinery. Drawing is also widely used in the several branches of engineering: civil, mining, highway, aeronautical, agricultural, building, chemical, efficiency, electrical, military, mechanical, municipal, sanitary, steam, water supply, maintenance, heating, dredging, hydraulic, hydrostatic irrigation, and acoustical, as well as surveyors, architects, aqueduct builders, bridge builders, caisson builders, canal builders, coffer-dam builders, cement contractors, masons, carpenters, crane operators, dock builders, lighthouse keepers, pier builders, pile-driver operators, pontoon-bridge builders, reservoir builders, telephone repairmen, landscape architects, salesmen, manufacturers, park-board employees, patent-office employees, statisticians, teachers, scientists, etc. The importance of drawing in the industrial world today is made more clear when one stops to think that everything used in this modern, specialized world of today, from a common pin to skyscrapers, is first worked out on paper by draftsmen. It is so important a part of industry that it is called the "language of industry."

The ultimate purpose of a mechanical-drawing course must be, as for all subjects in the curriculum, to contribute its share in the development of good citizens. As such, its aim must not be "to make draftsmen" for some local industry, nor just to enable the student to read blueprints, but to lay the foundation in the knowledge and use of drawing which will enable him to build a career of the highest possible usefulness to himself and to society, whether it be directly in the drafting profession or in any one of the professions to which it leads.

The specific aims of the drawing course must be fitted to the needs of the students entering the course. Three groups of students may be considered. For the first group, those going into industry, it is well to emphasize the economic value, while the major interest for the second group who plan to attend engineering college, must be its educational value, and for the third group, who make no practical demands upon drawing, the cultural value must be stressed. These specific aims of the drawing course may be classified as follows:

The Economic or Vocational Aim

I. Acquiring knowledge which functions in everyday situations of life.
   - A. Knowledge which is necessary for preparation to college:
     1. Necessary to undertake advanced technical or professional study in college, university, or technical training school.
     2. Laboratory or shop procedure necessary to undertake advanced technical or professional training.
     3. Knowledge of drawing to determine the qualities needed for success in the profession.
     4. Knowledge of one's own ability.
     5. Knowledge of the industrial opportunities of the vocation.
     6. Knowledge of the desirable and undesirable labor conditions in the trade.
     7. Knowledge of the importance of making definite preparation for a vocation.
   - B. Knowledge essential to the industry:
     1. Knowledge of the tools, processes, materials, and techniques of drawing in the industry.
     2. Knowledge of the materials used in industry and their processes of manufacture.
     3. Knowledge of the several industrial applications of drawing.
     4. Knowledge of the background and experience in drawing which will provide an intelligent approach to the field of industry.
   - C. Knowledge as the basis of culture:
     1. Drawing trains in aesthetics. The love of the beautiful is a priceless, spiritual quality which needs cultivation, for it uplifts the human race. It gives man capacity for joy in his work and a delight in his leisure hours. It gives him a sense of achievement, a feeling of having accomplished a worth-while task. It opens for him avenues of employment in other handiwork, and gives encouragement for his own creations. His own work is worth more to him than something which he could buy with money.
     2. The man who can draw must learn facts pertaining to several industries.
     3. He is trained to interpret and understand human needs.
     4. He acquires a knowledge and appreciation of the relation of drawing to industry.
     5. He learns to appreciate the common things of life.
     6. He acquires an appreciation of the interdependence of man.
     7. He is brought to a recognition of the importance and dignity of the work of the skilled worker.
     8. He gains knowledge of the elements and principles of design as interpreted in drawings.
     9. He finds out what are the social needs of the vocational worker.
     10. He studies the industries and products of different peoples and countries.
     11. He acquires interest in civic betterment through the contributions which industry can and does make.
     12. He forms ideals of careful workmanship, knowing that beauty and utility go hand in hand.
     13. He receives training and discovers the qualities required for leadership.
     14. He acquires knowledge which leads to systematic study and analysis.
     15. His interest in the historical development of the products of industry is aroused.
     16. He builds up within himself an appreciation of fine craftsmanship.
     17. He develops the power of visualization in remembering impressions.
     18. He acquires the ability to compare and evaluate.
     19. He develops constructive imagination.
     20. Factors of judgment in the use of tools and equipment.



Mechanical drawing. Harvey W. Waffle, Waukesha, Wisconsin

D. Skill essential for the college student:
   1. Skillful manipulation of the instruments used in drawing.
   2. Accuracy in making a drawing.
   3. Skill in reading a drawing.
   4. Ability to work and plan projects on his own initiative.
   5. Ability to collect, arrange, and and use data.
   6. Ability to measure and scale a drawing correctly.
   7. Ability to learn and practice correctly.

E. Skill necessary in industry:
   1. Systematic and skillful manipulation of the instruments.
   2. Accuracy in the making of a drawing.
   3. Skill in reading and interpreting drawings.
   4. Responsibility for the care of materials.
   5. Mechanical skill in the trades.
   6. Ability in draftsmanship.
   7. Ability to plan and work projects on own initiative.
   8. Development of high degree of workmanship.
   9. Knowledge and intelligent use of the principles of drawing.
   10. Ability to follow directions or direct others.
   11. Ability to collect, arrange, and use data.

F. Skill desirable for cultural training:
   1. Manipulation of the tools of drawing.
   2. Ability to express ideas and mental concepts graphically.
   3. Development of group activity.
   4. Ability to plan consistently according to organized thought.
   5. Discipline of the hand and eye in accuracy and dexterity.
   6. Development of habits of purposeful investigation.
   7. Desire to achieve definite and worth-while results.
   8. Development of self-control, leadership, and a consideration of others.
   9. Common usable skill that everyone should possess in this mechanical age.
   10. Development of high ideals of workmanship and achievement.
   11. Neatness and manual skill.
   12. Ability to follow directions or to direct others.
   13. Ability to use any material at hand for a definite purpose.

Educational Aims of Drawing

I. Training in skill:
   A. Development of skills which are helpful in vocational work even though the activity may be a hobby at the time.
   B. Ability to collect materials systematically and for a purpose.
   C. Ability to work and plan projects on own initiative.
   D. Respect for good workmanship.
   E. Gaining familiarity with handbooks and tables of value to the trade.
   F. Care of materials, order, neatness, accuracy, respect for the work of others, thoroughness, persistency, attacking a task enthusiastically and performing it conscientiously.

II. Training in associating meaning and convention:
   A. Ability to express ideas and mental concepts graphically.
   B. Skill in reading and interpreting designs, plans, and working drawings.
   C. Development of memory, judgment, imagination, originality, which are wholesome aids in the worthy use of leisure time.
   D. Disposition to experiment with the materials and processes of drawing.

III. Extension of general knowledge:
   A. Training in reflective thinking.
   B. Enjoyment of the contributions of others.
   C. Ability to carry on intelligent conversation on industrial topics.
   D. Training in the expression of ideas.
   E. Knowledge of the field of industry.
   F. Contact with the materials of the industrial world.
   G. Knowledge of the values of raw materials.
   H. Vocational-guidance information.
   J. Interpretation and understanding of human needs.
   K. Appreciation of the common things of life.
   L. Knowledge of processes, materials, and methods of construction.
   M. Appreciation of the interdependence of man.
   N. Study of industries of different peoples and their products.
   O. Exploratory experience in contact with different types of work.

IV. Training for wholesome enjoyment:
   A. Worthy use of leisure time.
   B. Appreciation and realization of the world about us.
   C. Interest in different "hobbies."
   D. Disposition to experiment with materials and processes for the sake of enjoyment.
   E. Joy in expressing and creating.
   F. Interest in the work of others.
   G. Ability to give pleasure to others.
   H. Confidence in one's own ability.
   J. Respect for the work done by others.
   K. Desire to share beautiful things with others.

Cultural Aims of Drawing

I. Knowledge as the basis of culture:
   A. Knowledge of the accomplishments of the race.
   B. Knowledge of the place of drawing in the industrial world.
   C. Judgment and discrimination in the purchases made by the individual.
   D. Vocational knowledge to help the student find his place in society as a worthy citizen.
   E. Knowledge of one's own talents.
   F. Knowledge of the contribution of drawing to health, happiness, and contentment.
   G. Appreciation of drawing in its relation to life activity.

II. Interests and appreciations as a basis of culture:
   A. Desire to express thoughts graphically.
   B. Development of high ideals of achievement.
   C. Gaining experience in creative effort.
   D. Participation in group effort.
   E. Sympathetic insight into the lives of workers in industry.
   F. Interest in higher economic standards of the home.
   G. Developing an attitude of research for the use of society.

III. Mental techniques as a basis of culture:
   A. Forming habit of recalling mental images — visualization.
   B. Development of judgment of selection.
   C. Development of constructive imagination.
   D. Development of originality.

IV. Skill as a basis of culture:
   A. Ability to express thoughts graphically.
   B. Fundamental training in skill later to be used vocationally.
   C. Co-ordination of the mind, hand, and eye.
   D. Co-operation in a group.
   E. Ability to plan definitely and work according to organized thought.
   F. Manual skill in the use of tools and instruments.
   G. Tendency to analyze all problems toward solution.
   H. Sustained interest until the completion of problem.
   J. Self-criticism — dependence upon one's own self for criticism.
   K. Habit of orderliness and cleanliness.
   L. Habits of accuracy, determination, perseverance, industry, self-reliance, initiative, analysis, attention, promptness, experimentation, appreciation, observation, deliberation, constructive thought, sense of achievement, etc.
   M. Motor skills necessary.

V. Development of aesthetic standards and appreciations of aesthetic values:
   A. These principles are the safe guides in the making of any article, or in passing judgment upon any phase of human skill. People should know good work and why it is considered

> good. Drawing trains in understanding and respecting the appropriate, essential, and utilitarian purpose of objects. The contribution of drawing in this respect lies chiefly in the development of a sense of appreciation of the work of others, which comes from an intimate knowledge of the labor and difficulties involved.

To summarize the above statements very briefly:

1. In all matters of construction, in the widest sense of the word, drawing takes the place of a knowledge of reading and writing in the other concerns of life, and is indispensable for giving and receiving intelligible ideas. Drawing gives skill to the hand in expressing ideas and concepts in visible form so that others may see and understand them, or so that an explanation may be made clear to others.

2. Since the large majority of people become workers with their hands, design, proportion, and construction which are taught in drawing should be taught to the majority. Drawing helps the child to find himself vocationally through its vocational-guidance and vocational-exploration values. There is also a cultural or avocational value for the boy who does not enter industry as draftsman.

3. Educationally speaking, drawing contributes to the development of habits of accuracy, perseverance, determination, industry, self-reliance, initiative, analysis, attention, promptness, experimentation, appreciation, observation, deliberation, constructive imagination, visualization, etc.

4. If culture is to be defined as the enlightenment and discipline acquired for mental and moral training, then as history and English are cultural subjects for the engineer, just so is mechanical drawing a cultural subject for the lawyer, business man, or minister.

Guidance and Industrial Arts

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The industrial-arts teacher has wonderful opportunities for guiding his students. This article shows how he can make use of them advantageously.

Industrial-arts teachers have greater opportunities for guidance work than have the teachers of other subjects. The shop teacher comes into more intimate contact with the boy, is his friend, and works side by side with him. He renders help and advice on things outside the boy's schoolwork. This fact is recognized in the Berkeley City Schools, where the industrial-arts teacher plays an important part in the guidance program.[1]

The activities of guidance in which the industrial-arts teacher may engage can be listed under the general headings of (1) individual guidance, and (2) group guidance. Under the term "individual guidance" may be listed the following:

I. Personal conferences with the boy regarding
   - A. The boy's interests and ambitions.[1]
   - B. The boy's personal characteristics which might stand in the way of his success.
   - C. Data on an occupation which the boy would like to enter. Such data would consist of:
     1. The advantages and disadvantages of the occupation.
     2. The permanency of employment in the occupation.
     3. The salaries to be expected in the occupation.
     4. The labor organizations in the occupation.
     5. The mental and physical requirements of the occupation.[2]
   - D. The boy's participation in extracurricular activities with respect to the advisability of engaging in or not engaging in certain activities.[1]
   - E. The boy's difficulties with other adults, other students, or with school subjects.
   - F. The boy's home life, and work life if he works part-time.[1-2]

II. Placing the boy in a job.[1]

III. "Following-up" the boy after he begins work by:
   - A. Visiting him where he works.
   - B. Talking to his employers about him for the purpose of smoothing out difficulties and helping him.
   - C. Securing facts about his work and working conditions for the purpose of better advising him.[1]

IV. Studying the boy in his shopwork to discover his personal traits and aptitudes.[1]

V. Advising the boy on adjustments or changes to be made in his school courses or classes.

VI. Improving the boy's study habits.

VII. Visiting the boy's home to gain the support of his parents and a knowledge of his home life.[2]

The industrial-arts teacher, to be of assistance in guiding youth, must understand and like the boys he wants to help. The teacher must be enthusiastic, and inspire enthusiasm in the boys. To the extent that time and enthusiasm permit, the industrial-arts teacher can devote more or less of his energy to personal guidance work.

There are a great many elements of guidance that can be undertaken by the industrial-arts teacher with the boys as a group. Some of these elements can be classified as follows:

I. Conducting class discussions on:
   - A. Extracurricular activities.
   - B. The qualifications of an individual which make for success, such as:
     1. Personality (personal characteristics).
     2. Educational requirements.
     3. Physical requirements.
     4. Living and working with one's fellow man, etc.
   - C. Particular occupations related to the shopwork of the instructor's special subject.
   - D. Safety and health precautions of the occupations related to the instructor's specific subjects.
   - E. The social values and importance of the particular occupations related to the instructor's special subjects.
   - F. Educational guidance in school leading to preparation for the occupations related to the instructor's particular subjects.[2]

II. Giving the boys exploratory experience in the instructor's special subjects.[1]

III. Gathering facts and information for the use of the boys regarding the occupations related to the instructor's special subjects.[1]

IV. Allowing the boys to participate in the running of the class as re-

[1]See reference No. 6 at end of article.

[2]See reference No. 2 at end of article.

gards discipline, etc., for the purpose of citizenship guidance.[3]

V. Using the foremanship plan for the purpose of developing leadership and followership.[3] The ability to follow orders and discipline oneself to leadership is as necessary to success in some occupations as is the ability to command.

VI. Making a special effort to develop character by the study of character aims as a means of social and personal guidance.[4] (This plan is followed in the Bristol, Conn., High School.)

VII. Guiding the pupils in their thinking to enable them to meet and master new situations, viz.:

A. To study conditioning factors. These factors are the special circumstances and influences which make one situation differ from another.

B. To analyze. To separate and place in order those facts which will lead one to a clear definition of the situation.

C. To synthesize. To gather the facts necessary for a clear definition of the problem.

D. To plan and execute.[5] Carrying out the solution to the situation is a necessary step in mastering new situations.

VIII. Talking to group meetings — P.T.A., luncheon clubs, etc. — about guidance work, its importance and value.

IX. Visiting industrial plants with the class for the purpose of acquainting the students with occupations by personal contact.

X. Calling for reports by students on special readings about occupations related to the instructor's special subjects.

XI. Developing interest in the scientific and related phases of the instructor's special subjects.[5]

XII. Using tests of aptitude and achievement to assist in the prediction of success for the students.

XIII. Being interested and enthusiastic about the boy first, and the subject next, in order to be of service as a counselor.[5-6]

[3]See reference No. 1 at end of article.
[4]See reference No. 3 at end of article.
[5]See reference No. 4 at end of article.
[6]See reference No. 5 at end of article.

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What to do With the Dull Child?

Paul C. Hoopes

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The author does not ask to keep the dull child out of the school shop, but he does ask to adapt the training to the pupil and not the pupil to the training.

For years there has been a prolonged debate between the "powers that be" and the man in the shop concerning the disposal of the' really dull child. To state conclusively that the shop is not the place for him is an error as great as to state that he does belong there. That this debate has had a prolonged airing is certainly no very great mark of that preponderance of intelligence that the teaching fraternity would like to believe exists within its ranks. More to the point would have been an honest effort on the part of both elements to understand better the points of view expressed, and the pupils under consideration, especially the latter.

Understanding goes before a decision of value. One must understand the mental characteristics of the dull child, how he thinks, why he thinks as he does, and why he is classified as dull, before good judgment can be used in helping him. That there is the dull child in our midst may be taken for granted. We need no expert advice to tell us that there are differences in the thinking qualities and abilities of children. Classifying accurately the really dull and the bored or disinterested may require some assistance and is certain to call for close observation.

The dull child is an individualist. His dullness detracts from his adaptability. He is too slow in his perception to see the need of adaptation to a new situation or to see the needs of that situation. He blunders along in what his slower faculties tell him is the right way. His reasons are *his* reasons more than those of a given situation. *"He"* looms largest in his own mind. "He" was the first thing he ever thought of and "He" has continued predominant ever since and probably will continue thus. Mental limitations bound the field of associated facts to thought for and of self.

This centering of thought on self is egotism. Praise caters to ego; railing and faultfinding hurt it. One may feel sympathy for the dull child, but great caution must be used in expressing it, else the ego will be offended. The natural curiosity and inquisitiveness of the more normal child is lacking. Sometimes this is due to ego, sometimes to lack of perception. If notice is given to new situations, then knowledge that they exist must be present before curiosity is aroused. Notice is given to changes in environment only when these changes are stimulating to the attention, then interest is aroused. The dull child with limited grasp of associated facts is of necessity bound to narrow limits in the number of things which arouse interest.

The arousing of interest is dependent upon the power to imagine. One must be able to hold the mental picture, to add and to subtract from it in the process of forming the perfect image. To place true values on the parts of the picture to the end that realization will be complete and the model perfect, requires a knowledge of matter, feasible placement of parts, and desirable arrangement of parts. Dull minds do not catalog readily, nor do the disinterested ones. The power for practical and accurate imagination seems to be the

father to invention and originality. Likewise the power to imagine seems to be the prerequisite for the attentive attitude. Attention may go before interest or they may be simultaneous.

This power of imagination may be graded. Certainly some do not have ability as comprehensive as do others, and it would seem that the lower the mental power the less the constructive imaginative power. Dull children do imagine themselves in roles of the hero, the public idol. This factor of emulation is, of course, not confined to the dull, but it is true that the dull child in his ignorance of values often emulates an individual whose accomplishments are far in excess of his own, desirable or undesirable as they may be.

It occurs often that dull children show interest because of the desire to emulate someone or some group. They are in this case at a loss when faced with the actual requirements demanded of their heroes. They have pictured self as the central figure, dressed in the proper garb, going through spectacular motions. The properties of the show have appealed, but no acquaintance has been made with the requirements for the actor. Discovery of the real demands for the job spoils the interest and discourages further activities. Interest thus changed becomes the interest of a spectator. Interest on the part of the dull child does not mean then that one will find a high degree of proficiency in manual dexterity. The quality of work does depend upon the quality of thought that may be brought to bear as a result of the interest aroused.

Physical stimulation is easy of accomplishment as compared with mental stimulation. The distinterested child may be goaded into action, but can rarely be driven to think. The interest must be aroused before thinking occurs. The truly dull child will duplicate the disinterested child's performance, but no matter how the interest is stimulated, the product of his labor will conclusively show his inability to imagine accurately.

Other characteristics of the dull child contingent upon his lack of interest and imaginative powers may be listed as lack of self-control as judged by the conditions of the moment, lack of responsibility, and lack of ability to concentrate and observe.

Let us look at the characteristics needed to do good mechanical work of the *origination* type. What are the qualities common to the reliable and good mechanic? The ability to think out or plan the work, measure or lay out with accuracy, cut and shape to the measured mark, and finally to correct any small errors that are made by even the best, constitute a rather skeletal outline. A keen mind for logical reasoning, an assembling in the mental storehouse of facts and reasons in a rapid reference way, practical originality, ingenuity, diligence, willingness to assume responsibility, observance of fine detail, the ability to reason from cause to effect and from effect to cause are further requirements. The greater the capacity for logical thinking, the better will be the mechanic. Such requirements preclude the acceptance of the dull child as a possibility for trade training, at least that sort of training that looks toward the master mechanic as its culmination.

That the dull child can be taught to do some so-called trade work is true. Frequent repetitions of the same operations, if monetary award is a goal and the emulative characteristics are catered to, will induce him to hold what might be said to be a maximum amount of attention for sufficient time to acquire some skill. Industry uses these people, not as skilled workmen in trade work, but for machine operators. Such repetition as is required of a production machine is also required as an adjunct to the machine from its operator. Machinery costs become prohibitive after certain stages have been reached, hence the manufacturers employ human machinery. The really intelligent person becomes bored to distraction if not affected nervously with such a monotonous grind: the dullard is happy and enjoys this sort of thing, as he thinks little and gets paid for moving.

To go back to the question "Should the dull child be 'dumped' on the shop?" it would seem that the answer would be "No." But to say "No" without qualifying the answer is dangerous. Certainly the dull child does not belong in the real trade school. In the shops teaching industrial-arts work in the broadest sense of the name, not as a trade, but as an academic subject, devoting its time to a versatility of training approached from a pupil-interest point, the dullard belongs just as much as he belongs in the academic classroom. The aims in both places are the same: the medium in one, logical thinking with a textbook as a schedule; in the other, logical thinking with the personality of the thinker expressed through his handiwork.

No adequate provisions have as yet been made to take the characteristics of the dull pupil fully into consideration, nor to attempt to prepare him for adult existence in a way within his reach. Folks may be born free but they are not equal in ability nor capacity. The evasion of public recognition of mental differences is not effecting a cure.

No doubt the fallacy of centering the dull child's school activities in the shop was arrived at by the simple deduction that he could use his hands if his head was empty. By all means, he should be taught to use his hands and he should be taught within his capabilities. His mental status must be considered first, then that thing found which fits his rating. He should not be deprived of his chance for economic stability, but neither should his better-equipped contemporaries be saddled with his ultimate care.

Into what grooves do these dullards fall without let or hindrance? In the jobs that employers know require a strong back and a weak mind. It is for this sort of thing that the stupid child must be trained. Gardening, farm labor, furnace tending, window washing, auto washing, some types of janitorial work, and so on, should be his training.

This sort of work requires but a limited amount of training, it is true, but to the dull child this small requirement looms large. Since he learns slowly, he should not be expected to learn so much. The quality of his thought being poor, the required grade of thinking should be low. After all it is not so much what the subject matter shall be, if within reach of his mastery, as it is what moral habits are implanted. Ordinarily employers are not concerned with the effects of labor in a moral sense upon their employees. Trainers of children must be. Given the opportunity and state authority to put in motion a program of training fitted to the individual, in place of trying to fit the individual to the training, there is little doubt that rapid strides would be taken in the direction of cutting down all sorts of juvenile delinquencies. Give a lad a goal within his reach, the encouragement to try, a real taste of pride in accomplishment, let him have the experiences of leadership within the group of his mental equals, establish honesty of purpose, and that lad has a chance to be a good citizen, independent of future charity.

To attempt an explanation of the physical requirements and equipment and possible funds needed is impossible. No two communities present identical situations and therefore cannot be treated alike. But every community is confronted with the responsibility of studying this vital problem of adapting the training to the pupil and not the pupil to the training.

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION
J. J. Metz, Editor

Advancing Oneself Professionally

Recently an academic teacher remarked that shop teachers, on the whole, are very unprogressive and do little to improve themselves professionally. When his attention was called to the fact that shop teachers at present are working, the country over, in preparing course outlines, instructional and illustrative material for their classrooms, that not a few of them are authors of books, and that many of them contribute to their professional magazines, this teacher expressed polite incredulity. Besides this, attention was called to the fact that many shop teachers spend at least part of their vacations in attendance at summer schools. This last statement especially was challenged by the academic teacher, whereupon the writer made a study of the attendance of shop teachers at summer school for the years 1934 and 1935.

Out of the 86 institutions that were asked to give information on this question, 54, that is 63 per cent, answered. It was found that 2,199 shop teachers attended these 54 institutions during 1934, while the attendance at the 1935 summer-school session rose to 2,690. This is an increase of 22 per cent.

According to the findings of this rather limited study, it would seem that shop teachers are not so unprogressive as some seem to think, and it is questionable whether the summer-school attendance of nonshop teachers can equal the mark set by their brethren who teach industrial arts and vocational subjects.

Most shop teachers are quite eager to advance themselves professionally, and do so by various means. There are still too many, however, who, once having obtained a job, are willing to settle down. Some of these do a very good job of teaching, too. They forget, however, that we are living in an age where the educational standards of the teachers of the past are no longer looked upon as sufficient.

The time is not so long past when there were many school principals who had no more education than that received at a two-year teacher-training institution. At present, however, there are many high schools that will not accept teachers who do not have at least a bachelor's degree. It is not uncommon to find shop teachers with master's degrees, and there are some — still teaching in shop or classroom — on whom a doctor's degree has been conferred.

Confronted with these conditions, shop teachers ought to see the necessity of availing themselves of every opportunity to advance professionally. Extension work, evening school, summer school — all will assist one toward the longed-for goal. Of course, this means additional labors, but they must be assumed if one wants to remain in the vanguard of one's profession. Even though the acquisition of additional scholastic credit means more and arduous work, there are recompenses not the least of which is the companionship with the progressive type of teachers afforded by attendance at teacher-training courses.

Teachers who lack scholastic credits should not overlook the trend of the times. The opportunity for planning is right here and now — ten years from now may be too late.

Mannerisms in the Classroom

Many teachers are very much upset by the mannerisms of some of the students in their classes. They cannot conceive why Willie has to grunt when he does certain work, why Johnny must stick out his tongue while he attempts a given operation, why Jimmie must preface each remark by a clearing of the throat, why Tommy must sway from side to side while he recites, and so on. Some teachers try to improve these conditions by making sarcastic remarks about the offending student. They feel that by making the student feel "ashamed" of himself they are doing him a favor, because as a result he corrects his habits.

These teachers have the right intention, but they use a poor method for gaining their ends. Most mannerisms of this kind are due to the student's self-consciousness, and it is best to eradicate the defect in some way other than by increasing his feeling of embarrassment.

There is, however, another side to the annoyance by these peculiarists in the classroom. Has the teacher ever examined his own ways of doing things before his class? May not he, too, have certain habits that annoy this or that student in the class? It takes a careful check-up to discover the numerous idiosyncrasies almost every man develops. These are especially apparent when found in a teacher, and needless to say, they should be eradicated as far as possible. They frequently detract considerably from teaching efficiency, and while many of the best teachers are not free of them, their success is traceable to other strong qualities which help them succeed in spite of the obstacles which existing mannerisms impose.

The teacher who is searching for peculiarities which he himself may have and which are to be eradicated, should specially study his speech. Many people habitually mispronounce common names or words. It not infrequently happens that students plan questions so that their teacher may have a chance to use and mispronounce his pet word to the huge delight of the class. That the knowledge of the teacher's weaknesses are not kept secret, everyone who is acquainted with students knows.

Another thing to watch is one's posture. If we could but see ourselves as others see us. The "angleworm" poses assumed before the classes, the negligent, blasé attitude many assume — all affected or unconsciously adopted mannerisms which would be better discarded.

Then there are those who assume certain facial expressions when giving their classes important information. These and many other mannerisms are part of the stock in trade of many teachers.

The very fact that the students' peculiarities annoy the teacher ought to incite the teacher to check himself for

mannerisms that may annoy the student. The only method for finding out whether one is guilty of some of these idiosyncrasies is by making a careful check-up, and then by following this with a carefully planned and strenuously adhered to program of eradicating them.

Change and the Shop Teacher

One hears so much of *change* these days that the word assumes almost frightening dimensions. There has never been a time when change was not going on, and when it did not have to be taken into account. Of course, the rapidity of change at different times in the history of the world has not been constant. There has been probably no time since the dawn of the world when change has been as rapid as it is now, and yet even now, the individual changes do not come to their conclusion as rapidly or with the finality one would suppose when reading about them in the daily press, or hearing their occurrence reported from the speaker's rostrum.

Teachers of industrial arts and vocational education, therefore, need not become panicky when considering their work in connection with change. It is certain that shop teachers must continually study the advances made by industry. They must not, however, jump at every indication of a change in method as adopted by industry, and look upon it as a sign that the entire shopwork in the school must be altered.

Many years ago, it was said that the art of lithography was dying out. Today, after some thirty or forty years have elapsed, there are still quite a number of the old stone lithographers working at their trade, and lithography, with some changes, of course, has come into wider use than ever before.

Fabricated-steel houses, and houses made of cement by special processes, have been promised and discussed for years. Yet we may be sure that carpenters, bricklayers, and masons will be required, and will have to be trained for many years. Right now, there may not be such a great call for horseshoers, yet there are many of them still plying their trade, contrary to the expectation of those who predicted that the introduction of the Model T had doomed old Dobbin.

We frequently hear that the day of the specialist is over, and that the skilled artisan is no longer needed; that the machine furnishes precision, and that semiskilled and common labor will be all that is needed henceforth. Yet, the people who make these assertions seem to forget that the precision built into the machine is the result of the work done by highly skilled mechanics, and that one machine seems to be the precursor for just another machine, which will be more accurate and more versatile than its forerunner. They forget also that these succeeding machines are not built by machines but by men — skilled men, some of whom may perhaps be specialists, while others must be all-round mechanics — trained to do constructive thinking besides accurate work.

All of this brings us to the fact that the shop teacher must continually be looking forward, but he must also keep his contact with the present and with the past. There is need for skilled mechanics, if not right now, then in a comparatively short time. Industry is doing nothing now to prepare its workers, hence the school must. Industry does not know just what kind of workers it will need, but when the need comes, it will loudly blame the schools for not having prepared them.

In the meantime, what is the shop teacher to do? Probably the indications are clear enough now that the future will require skilled workers and many of them. Probably, too, these indications may show the need for mechanics trained for a wider range of skills. This, too, can be met by the shop teacher. This broader training will enable the student to shift with greater ease within an industry, and seems to be what the future demands. Whether this be true or not, time alone will tell. Change will continue to be the order of the day, and the shop teacher must keep on unperturbed, ready to make changes in his course whenever conditions seem to require it. He need not be worried about the requirements that "change" will lay on him and his schoolwork as long as he keeps his mind flexible, studies conditions as and when they develop, and then makes changes as they seem advisable and necessary. This is merely another way of saying that the shop teacher must develop a problem-solving attitude and consider his daily work as a new problem from day to day.

The Dawn of the New Year

As 1935 draws to its close, one's thoughts inadvertently trace back over the months which separate us from its beginning. As this is done, strange pictures flash before us on the mental screen. Some of them portray joys, some sorrows. The sum total pictures a given span of our lives — a chapter, one might say.

The teacher in his retrospection will naturally see in these mental pictures the portrayal of much that has transpired during the time which he has spent in the classroom. He will see in pleasing colors some of his successes, but he also will see some of his failures and near-failures.

Why, for instance, did he not score as well with one class as with a certain other class? Considering this question carefully, brings up a further query — can all of the blame for the difference in results be placed on the students? There are differences between individuals and there are differences between groups of individuals. Has every effort been made to take care of these differences? Can anything be done to bring the class that has slumped so woefully, to some semblance of decent progress? Just what has caused the failure? What steps can be taken even now to improve existing conditions? How can the work of all classes be stepped up?

These and other thoughts are timely and proper as we make ready to enter the new year, and the teacher who spends some moments in this type of retrospection not only follows a natural inclination, but may feel proud as well that his thoughts have taken not only a personal, but a professional trend.

Get ready — Get set — Go!

The Pushmobile Race

Wilbur S. Nay

Ames, Iowa

The pushmobile contest as an attention getter for industrial arts in the school deserves thought and study.

In order to be fully understood and appreciated by a community, industrial arts should be advertised. However, the practice of advertising has not been overemphasized by industrial-arts teachers in the past because many teachers consider it unprofessional, others feel that their subject needs no advertising, still others have a sense of modesty, and then there are those who are just indifferent.

The successful industrial-arts teacher should have, for his own guidance, a program of advertising during the school year. The alert teacher will employ various methods of "selling" his subject to the community. Among these methods there exists a very effective type known as the "contest." This is not a new method, as many kite, model-airplane, and model-sailboat contests have been held. The one described in this article, however, is a pushmobile contest. The pushmobile is a small motorless car about 5 ft. in length with seating capacity for only one.

A pushmobile contest is well adapted either to the seventh or eighth grade. The boys in these classes are of an age when they are very interested and active in any new undertaking. While boys in both the seventh and eighth grades may participate in the contest, it is probably better to restrict the event to one or the other for two reasons: First, the level of achievement is not the same, and second, the boys should have the opportunity to work together on their cars.

The first problem which presents itself in carrying out a project of this kind is to interest a sufficient number of students so that they will want to make cars for a race. To have a successful contest, at least ten cars should be entered, a requirement which means that twenty boys would participate in the event, since a driver and a pusher are necessary for each car. Usually it is not hard to interest boys in any kind of contest, especially one in which they will have the opportunity to make something of a mechanical nature. Enthusiasm may be aroused by showing them pictures of pushmobiles, by making a drawing or sketch on the blackboard, by having a finished pushmobile for them to inspect, or by explaining to them as carefully as possible how the car will look and how it may be made.

After the required number of students have shown evidence of wanting to build pushmobiles and take part in a race, it is necessary to divide the boys into teams. In pairing the boys, it is advisable to have those living in the same neighborhood work together, so that after the race they may take the car home, thus constituting a joint ownership. However, this problem takes care of itself very well since most boys have a chum with whom they prefer to work.

When the boys are divided into teams, plans for immediate construction should begin. The instructor may require each team to make a drawing or sketch of its proposed pushmobile, or the instructor may make a drawing on the blackboard and have the pupils draw a similar one, or blueprints, showing a typical pushmobile, may be handed out. At any rate, more educational value will be derived if each team can have a share in the planning of its own car. There will need to be certain designs and dimensions common to all the cars, but individuality should not be restricted.

While this process of planning and designing is being conducted at school, the boys must be collecting wheels and axles at home and elsewhere. The boys have little difficulty in securing these from old coaster wagons or baby carriages. The steering wheel may be obtained at small cost from an auto salvage company. With these essentials procured, the rest of the material for the car may be found in the scrap yards, or purchased from the school shop.

Construction of the car may begin after the plans have been checked by the instructor and provision has been made for the materials to be used. Close supervision on the part of the teacher is required at all times; during a pro-

gram of this kind the boys are inclined to work too rapidly in order to be ready for the race that they are so anxiously anticipating. After completing their pushmobiles, the boys usually want to paint their cars. This step offers an excellent opportunity for individuality, because each team tries to surpass the others in design. Consequently, many color combinations and streamlined effects may be displayed.

The cost of the cars depends mostly on how much material the boys have been able to bring from home. The average pushmobile will cost between $1.00 and $1.50. It is always advisable to collect the money for the material as soon as the car is completed or at least before the race.

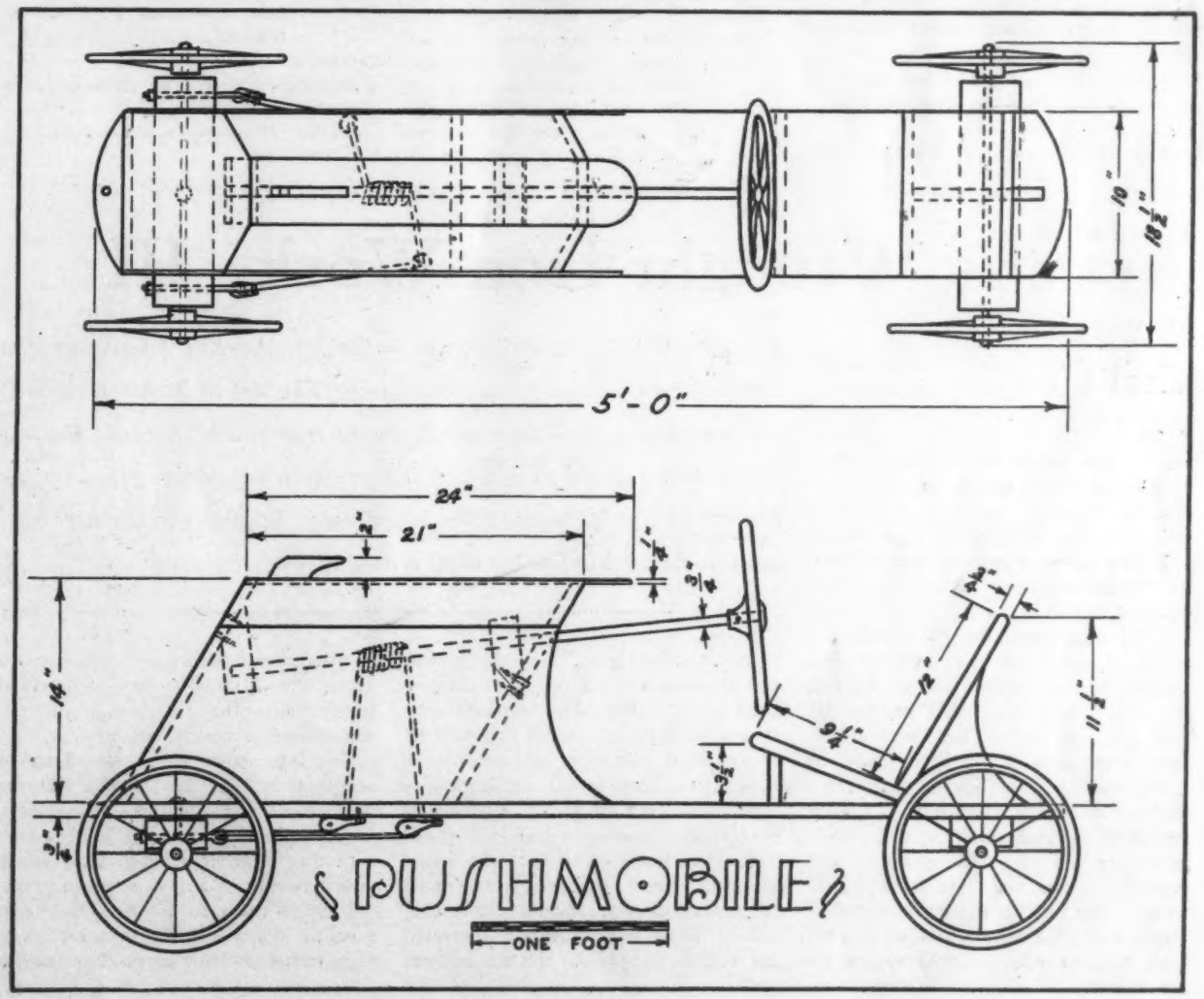
During the four to six weeks that the pushmobiles are being made, the instructor should be planning and carrying out his scheme of advertising and preparation for the race. The success of the event depends very largely upon the initiative and ability of the teacher in executing this phase of the project. At least three weeks previous to the date set, he should start collecting the prizes. This may be done by contacting various business firms about the town and asking them if they would care to contribute some small article or money toward the success of the race. Firms which the school shop patronizes very often will contribute freely for such an occasion if allowed the opportunity of advertising. Usually they give the boys paint caps or similar articles to wear during the race. Various other schemes for securing prizes or money with which to buy prizes may be employed. Service clubs are glad to do their part for such a cause. By holding the race on Armistice Day or some other holiday, the prizes may be given by the committee in charge of the local celebration.

The local newspaper is willing to cooperate in advertising a contest of this nature, and through this medium much interest can be aroused in a community. It is a good plan to announce in the paper the names of the boys participating in the race and the prizes offered. In addition, the newspaper photographer might be encouraged to publish a picture of the pushmobiles with their owners.

Posters made at school in the art classes and posted in store windows and in the school building help to stimulate interest. The best advertising will be through the boys themselves, for they will spread the news more completely and enthusiastically than any other available means could.

Other details that must be arranged prior to the race are the engaging of officials to judge the winners and the selecting of a place to hold the event. By consulting the city officials, permission may be secured to have at least two blocks roped off for the race track. Interest and importance are added to the contest if arrangements can be made to have a moving picture taken. This picture would prove valuable for later use in motivating similar projects.

On the day of the contest, the boys



should plan to meet at the school with their pushmobiles and form a parade. The parade with all the new pushmobiles and their proud owners will make a handsome showing as it proceeds to the racing course. It is usually advisable to appoint someone not in the race to act as general repairman, for more than likely just before the race starts there will be a wheel to fix, a guiding apparatus to tighten, or a bearing to oil.

If there are to be ten or more cars entered in the race, it will be necessary, due to the narrowness of the street, for them to run in two or more heats. By using this method, a longer performance results, and the crowd receives a more complete entertainment. The final race, of course, would include only the first two or three winners of each preliminary heat.

To make the race eventful and entertaining, certain rules may be made. One rule that adds to the quality of the race is to have the pusher exchange with the driver at a certain point on the course. If the race is to be two blocks in length, the driver and pusher should exchange at the intersection of the first block. This often causes some rather amusing incidents, and likewise gives each boy a chance to drive.

After the final race, prizes for the first three or four places may be awarded. If the instructor has been successful in securing enough prizes, all the boys may be given small souvenirs. The teacher should see that a full account of the race events is published in the newspaper.

There are many benefits to be derived from such an undertaking, but perhaps the most outstanding one is the advertising that the industrial-arts department of the school receives.

PREPARATION FOR BUILDING PUSHMOBILES

Franklin School — Assignment Sheet No. 1
W. S. Nay — 7th-Grade General Shop

General Information:

Six weeks from now we shall hold our annual 7th-grade pushmobile race. The event will take place downtown on a roped-off street. Prizes are to be awarded and motion pictures of the race are to be taken.

Preparation:

I. Information to be written and handed in not later than Monday of next week.
   A. The name of your partner.
      1. Choose a partner to help you build and buy the car and run with you in the race. It is better that he be a neighbor boy, so that you can share the car at home, and that he be a member of your class.
   B. Three numbers.
      1. Select at least three numbers for your car, from which one will be chosen.

II. Collect the following material with your partner and bring it to school for approval not later than Monday of next week:
   A. *Four good wheels,* not less than six (6) inches in diameter. (Note) These may be wagon wheels, tricycle wheels, baby-buggy wheels, or others.
   B. *Two axles for the wheels,* the space between the wheels to be not less than fourteen (14) inches.
   C. *A steering wheel and a shaft* from an old automobile. If you are unable to find this kind, get another wheel like the first four, and a broomstick for the shaft.

III. Material due this Friday.
   A. Write out to hand in.
      1. Draw four (4) freehand sketches of a racer.
      2. Describe how a steering device may be made for a pushmobile. (Use a diagram if it will be helpful.)

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Artistic Wrought-Iron Work—III

C. Weiler and Karl Ufer

New York City

(See Supplement No. 322)
(Continued from the December issue)

The third of this series of articles on the design and techniques used in working with wrought iron. The name "The Art of Metal Working" has been changed to "Artistic Wrought-Iron Work" because the lecture demonstration from which this article is taken was given by the Wrot Iron Designers with the intention of helping the teachers who use this sturdy material in their school shops.

Chart III

With this, we leave the more important basic elements of design as applied to wrought iron and go on to show some of their advanced forms. Chart III shows a series of legs that may be utilized in many different ways. Figures 1 and 2 show some simple yet exceedingly graceful forms. Figures 6 and 7 show how these same forms may be embellished, both with additional scrolls and as in Figure 7, with a leaf. The ever-existing danger is that the embellishments may be added in places and positions where they are least appropriate. This will be further discussed in Chart V. In the construction of any design, two essentials should always be borne in mind: first, that the growth and development of design is largely imitative of nature. The preponderance of weight of design should therefore be at the base and taper off toward the extremities. Also, in the application of conventionalized ornament, it is usually incongruous to apply a leaf in a downward direction, since it normally grows upward. Second, the design also must take practical requirements into consideration. Thus, form must not be created nor ornament applied in such manner as to become a hindrance or nuisance in actual use. Strange to say, impractical design more often than not is also unattractive and poorly balanced.

The legs shown in Figures 3 and 4 are of more elaborate nature, showing harmonious combinations of curves. Figure 8 is the same as Figure 3, except that it is embellished with scrolls and a rosette. Figure 5 shows a graceful use of the square twist. While it is possible to apply twisted iron in curves, it is rather difficult to produce, and it

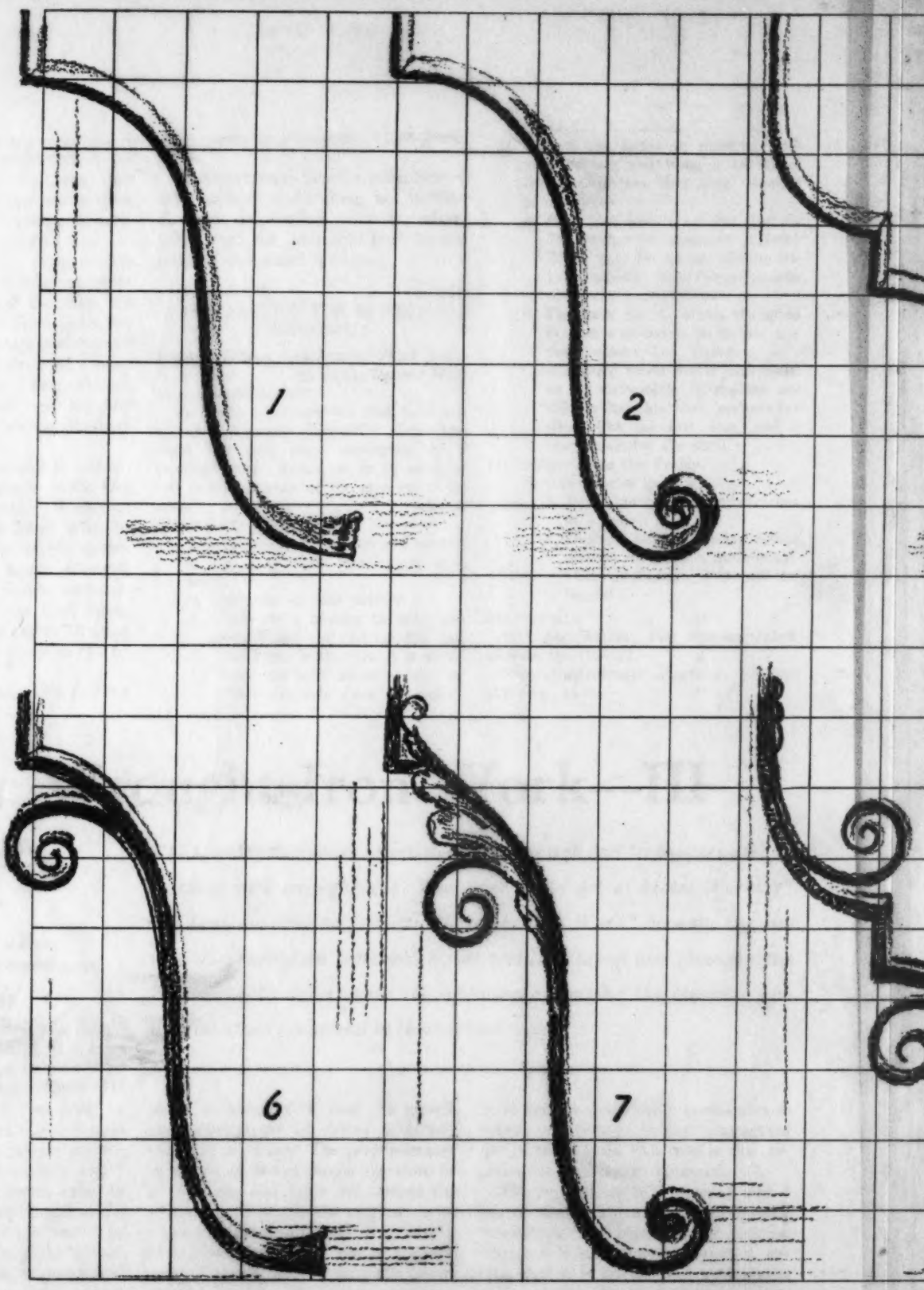

Chart III — Artistic Wrought-Iron Work—III, by C. Wel

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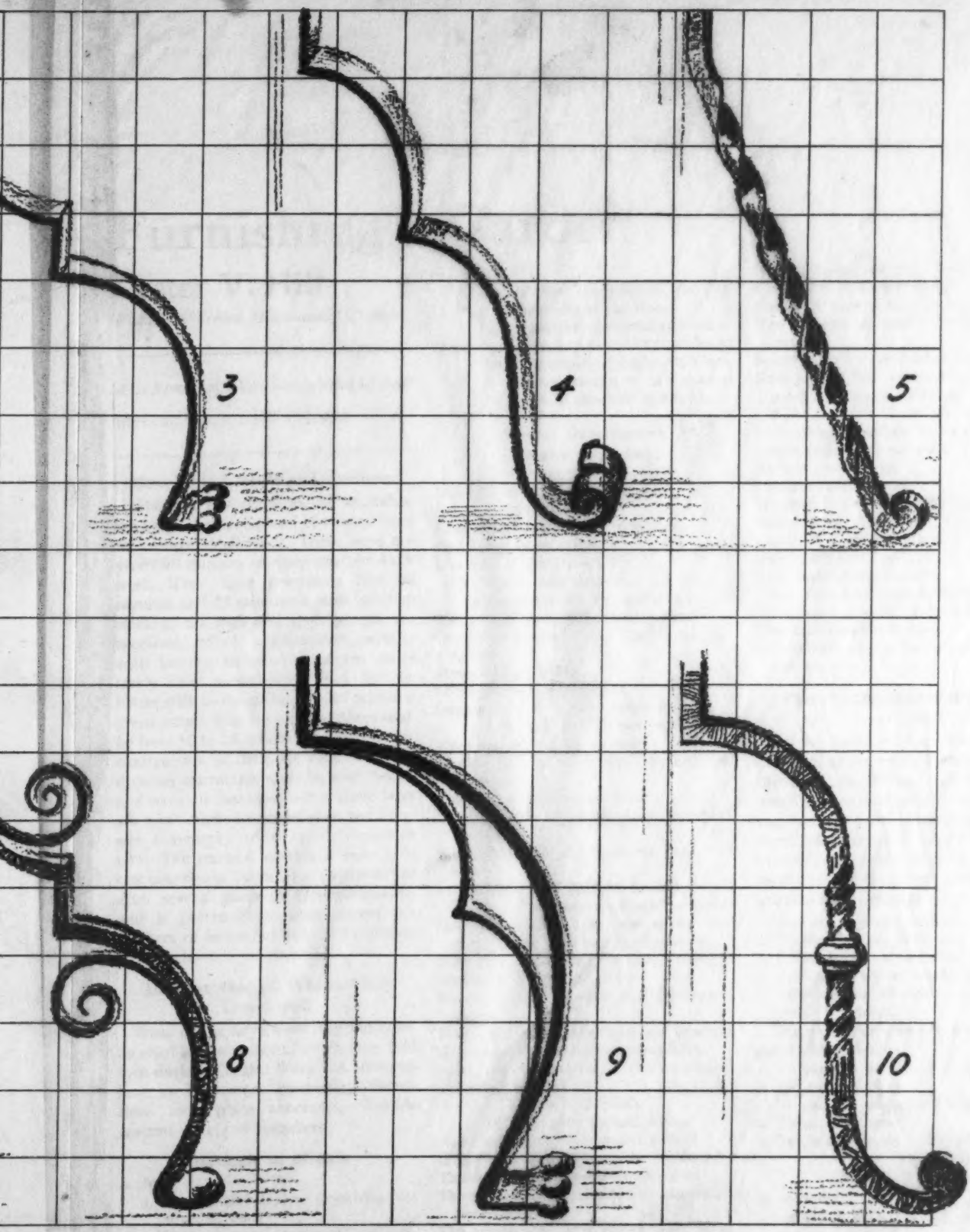

k—III, by C. Weller and Karl Ufer, New York City. (See page 14)

is recommended that it be eliminated from schoolwork, especially in heavier material. Twisted iron is, furthermore, somewhat difficult of treatment in design. Figure 9 is selected to show how a very simple major curve may be beautified with contrasting rather than harmonizing curves. Figure 10 is a happy solution of a square twist in conjunction with curves. Notice that where the twist is utilized, the iron remains straight. The twists are pleasingly divided by an ornamental tie band or collar.

The ends of the various legs shown on Chart III show the applications of the basic forms which are illustrated in Charts I and II. The selection for these ends must be judiciously made so that they are in harmony with the general character of the design.

Furnishing a Garden

Lester V. Hill

Buchanan School, Richmond, Virginia

A scheme of choosing content and method for a unit of work.

How This Unit Was Developed

The unit was developed for an industrial-arts class composed of twenty boys of average intelligence. These boys are given 90 minutes of shop practice each week. They have previously had 60 minutes and 75 minutes a week of shop work in the fifth and sixth grades, respectively. Shop organization permits each boy to choose his project quite freely from a well-supervised list, or better still, to design his project within a given range. This means that there may be from 10 to 20 different projects under construction at the same time. Here individual instruction must be used. Social and economic backgrounds of these boys are what might be expected of the average community of a typical southern city. The method employed here is a teaching device formulated by the writer after several years of experimentation, and is patterned to some extent for teachers of industrial arts in Richmond public schools.

Interest Out of Which Unit Developed

Some of the boys were very much interested in lawn chairs, which they had seen during "Garden Week" as observed here in Richmond. Interesting discussions took place concerning notable gardens here and elsewhere.

Development of Unit

A. *Jobs:*
1. To construct a piece of garden furnifure of wood.
2. To use cement or concrete for casting a piece of garden furniture.

B. *Industrial Units:*
Elementary concrete and junior woodwork.

C. *Aims:*
1. To increase appreciation for improvements about the home.
2. To impress the vocational and avocational aspects presented by the design and construction of garden furniture.
3. To provide practice of fundamental and technical processes involved.

Plan of Development

Teacher's Activities

Points to be Emphasized

Materials used in industry
Source of materials
Commercial names and trade terms
Fundamentals of woodwork
Elements of good concrete:
a) Cement manufacturing
b) Composition of concrete
Elements of good form construction
Use of concrete about the home and garden
Styles in bird houses
Local birds and their traits
Some local flowers and shrubbery

Methods to be Employed

What are the materials used?
Where are the materials produced and marketed?
Make a list of technical terms
What principles of elementary woodwork are involved?
What advantages does concrete have over wood?
In what ways can concrete be used to add beauty and convenience about the home?
Information about the composition and manufacture of cement and concrete
What is a good design for a bird house?
Observe traits of local birds
Name and identify some local flowers and shrubs
Make and read simple landscape drawings
What are some vocational possibilities?
Name and locate some notable gardens of Virginia (and local)

Pupil's Activities

What Learner Should Know

Name and identity of materials used
Where such materials may be purchased
The definition of common trade terms
The application of principles of elementary woodwork
The advantages of concrete over woodwork
Ways to beautify home
Something about the composition and manufacture of cement and concrete
How to design and build a bird house
Some traits of local birds
Names of some local plants
How to read or make a simple working drawing
Something about vocational possibilities
Something of the historical background of notable gardens of Virginia

What Learners Should Be Able to Do

Identify and purchase materials
Locate markets of materials
Explain trade terms
Use woodworking tools
Construct a piece of garden furniture
Mix a batch of concrete
Construct a concrete form
Cast a concrete mold
Help beautify his home
Read and make a simple drawing
To design a piece of garden furniture
Care for flowers and plants
Vary designs of a trellis or piece of garden furniture

Plan for Instructor to Carry on Unit

As we had no shop library with a source of related information and other literature, books and other materials were ordered and much free literature was received from industrial companies. A critical analysis of this Unit served to evaluate its justification for development. As a result, it was found that the learners might engage in:

1. Reading, working, drawing.
2. Making working drawings.
3. Creating and varying designs.
4. Tracing history of notable gardens.
5. Collecting and discussing current events on the subject.

Out of these possible activities, the pupil should learn:

1. To interpret working drawings.
2. To design projects.
3. To use and understand trade terms.
4. To use references.
5. To make informal interviews.

Desirable Outcomes

A. *Attitudes:*
Willingness, co-operation, responsibility, respect.

B. *Understandings:*
1. Of the need of manipulative skill in modern construction.

2. Of the importance of gardens to health and home beauty.
3. Of trade and garden terms used in intelligent conversation.

C. *Appreciations:*
1. Of the role of garden life in modern living.
2. Of natural sciences involved.
3. Of related discoveries, garden history, and notable contributions.

D. *Abilities:*
1. To converse intelligently on related subjects.
2. To differentiate types and classes of garden life.
3. To construct and design pieces of garden furniture.
4. See other abilities listed in "Plan of Development."

E. *Possible leads to other Units:*
1. The U. S. national gardens and parks.
2. Commercial furniture manufacture.
3. Concrete and its value in modern life.
4. How to help beautify our homes.

Materials Used

A. *Environmental:*
Lumber and lumber supplies, cement and concrete supplies.

B. *Printed:*
"Model Gardens," "Historical Gardens," bulletins, pamphlets, and drawings.

C. *Construction:*
Tools, materials, supplies, and equipment.

Activities

1. Discussions
2. Experimenting
3. Testing
4. Observations
5. Interviewing
6. Visiting
7. Window shopping
8. Contest and purchasing

Evaluation of Unit

This individualized unit illustrates very clearly the writer's ideas of teaching industrial-arts work. It is admitted that much planning, hence, harder work, must be done by the instructor. But the attitudes, skills, and appreciations established in young minds are rewards that far more than compensate for the extra efforts expended. This method of shop instruction was operated, to some extent, this school year, with a marked degree of success. This proved to be a most effective means of correlating related information with projects under construction. In this connection, this *individualized-unit* method was found to be most efficient and produced invaluable results.

Sailing Kinks

Claude W. Horst

Milwaukee Vocational School, Milwaukee, Wisconsin

An article which will prove exceedingly interesting to all who are interested in model-boat building.

Accurate sailing of a model boat involves the use of considerable science, but the underlying principles are really quite simple, and if they are understood and kept in mind during the period of building and rigging, individual models will have a great deal less tendency to be temperamental.

Even when a model has been built carefully and accurately according to authentic specifications, it is frequently found that it will not hold true to a course. Sometimes it is the stern and sometimes the bow which is blown around causing the boat to head into, or away from the wind. Holding true to a course requires a perfect balance between the sails and the submerged area of the hull. The pressure of the wind on the sails must be so distributed that a point representing the resultant force, called the *center of effort,* is almost directly over the central point of the submerged area of the hull, called the *center of lateral resistance.*

Center of Lateral Resistance. On authentic designs the center of lateral resistance will have been accurately determined and is usually marked C.L.R. One method of locating it when it has not been indicated, is to cut a silhouette template of the underwater body of the boat and, using a pin, find the point where the template will balance, as shown in Figure 1. This point of balance is the center of lateral resistance. Another method of locating it is to place the completed but not yet rigged hull in a tub of water and discover the point where a rather sharp stick pushed against the side of the boat will move the boat through the water sidewise without turning.

Center of Effort. To indicate the position of the center of effort on the sail combination, designers usually use a circle and cross marked C.E. The center of effort of a triangular sail is determined geometrically by drawing medians from the three sides, as shown in Figure 2. The point of intersection is the center of effort. To determine the center of effort of two or more triangular sails in combination, first find the center of effort of each sail separately. Then draw what is called a reference line perpendicular to the waterline. This line is usually drawn through the tack of the foremost sail. Measure the distance between the reference line and the center of effort of each sail. See Figure 3. Multiply the area of each sail

$$\text{area} = \frac{\text{base} \times \text{altitude}}{2}$$

by the distance of its center of effort from the reference line. See Figure 4. Add together these products and divide by the sum of the areas of all the sails. The quotient obtained will represent the distance from the reference line to the common center of effort of the entire sail combination. See calculations, Figure 3.

To find the center of effort of any quadrilateral sail, divide the sail into two triangular sails, and proceed as described for a combination of several sails. See Figure 5.

The center of effort for a single sail may also be found quite easily by making a template of it and determining its balancing point with a pin. This point is the center of effort of the sail. The same method used for a combination of several sails will not be so accurate but will give a fair approximation. See Figure 6.

Placing the Sails to Secure a Balance Between the Center of Effort and the Center of Lateral Resistance. Theoretically the mast of the boat should be so placed that the center of effort on the sails would be in a perpendicular line with the center of lateral resistance as determined on the hull. But the sails, having their center of effort some distance above the water, create a powerful leverage in a strong wind, so that

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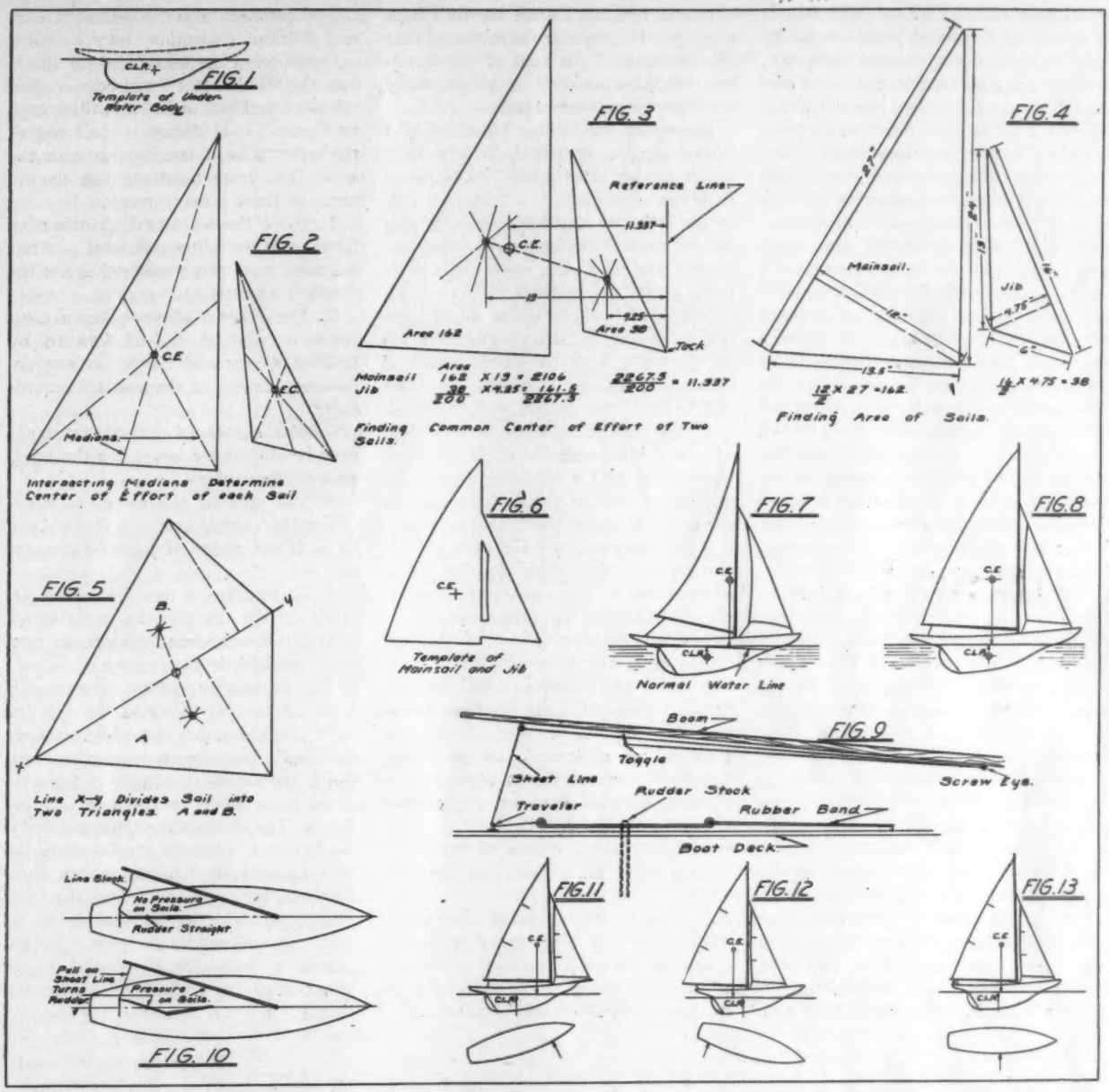


the wind through its effort in moving the boat ahead is opposed by the resistance of the boat in the water holding it back. These opposing forces cause the nose of the yacht to be forced down deeper in the water while the aft end is raised a corresponding amount. See Figure 7. In addition to this, the movement of the boat through the water causes the water to pile up at the bow. These factors have the effect of changing the shape of the submerged portion of the hull which in turn changes the position of the center of lateral resistance by moving it forward, and thereby disturbing its relation to the center of effort of the sail combination.

The relation of the center of effort and the center of lateral resistance is further disturbed by the adjusting of the sails which must be done to meet various sailing situations. As the sails are swung outward, the center of effort is moved forward. The effect is far less than that of the forward shift of the center of lateral resistance as models are fairly close-hauled when sailing, nevertheless, it is a factor to be considered, except in sailing before the wind.

It follows, then, that the center of effort, instead of being placed directly over the calculated center of lateral resistance, should be placed some distance farther forward slightly aft of the point to which the center of lateral resistance is likely to shift. Experiments have shown that most of this shift may be corrected by placing the sail combination so that the center of effort is forward of the calculated center of lateral resistance approximately 5 per cent of the waterline length of the boat. See Figure 8.

The Sliding Mast Plate. Since the relationship between the center of effort and the center of lateral resistance cannot be calculated accurately, the use of a sliding mast plate is recommended so the whole sail combination may be moved slightly forward or aft to secure a more delicate adjustment.

The Automatic Steering Device. An automatic steering device is a rudder

attachment through which the rudder is actuated by the wind pressure on the sails through sheets, running lines, etc., for the purpose of putting the model boat back on its course when it starts to head into the wind. There are a number of different types of automatic steering devices ranging from a very simple tiller to steering quadrants with all sorts of more or less complicated adjustments. The functioning of all the more common types may be understood from a study of the simple tiller which is nothing more than a small beam attached near the center of its length to the rudder stock. See Figure 9. The mainsail sheet is attached to the aft end of the beam and a rubber band to the front end as shown in Figure 9. As the wind pressure on the mainsail increases, the pull on the sheet line increases, pulling the rudder with it. As the wind pressure decreases, the pull of the rubber band brings the rudder back to the central position. See Figure 10.

But this action of the automatic steering device is an aid in bringing the boat back on its course only when the boat heads into the wind. When it heads away from the wind, that is, when the bow is blown around with the wind, it merely increases the poor sailing. Consequently, it is important so to arrange the relationship between the center of effort and the center of lateral resistance that the model will not have a tendency to head away from the wind. This is done by placing the mast so that the center of effort is a very little aft of the actual sailing center of lateral resistance. Whenever it is at all forward, the boat will tend to head away from the wind. The sailing center of lateral resistance is always somewhat forward of the center of lateral resistance when the boat is at rest, but it should be remembered that the estimated 5 per cent of the waterline length of the hull is seldom really accurate for a given model.

Improving the Sailing Qualities of a Model Yacht. A model already built which consistently heads into or away from the wind instead of keeping a true course is by no means hopeless, as any one of several things may be done to correct the difficulty, once the underlying causes are understood.

The model which heads away from the wind has its sail combination too far forward. This condition, which is shown in Figure 11, causes the front end to be blown around with the wind.

1. The most fundamental correction, of course, is to move the whole sail combination aft. This is easily done if an adjustable mast step has been used in the construction of the model, otherwise it is necessary to move the mast aft and restep it. Rather than do that, it is often easier to try some other method of accomplishing the same result.

2. The center of effort of the sail combination may be moved aft by making a new and larger mainsail and decreasing the size of the jib accordingly.

3. The center of lateral resistance may be moved forward by decreasing the blade area of the rudder. This is often sufficient if the correction needed is not too great.

4. Decreasing the area of the fin by cutting away the aft end has the same effect.

5. The entire shape of the underwater body may be changed by making a new fin which extends further forward, if a thin fin which can be replaced without any great effort, has been used.

6. Sometimes a combination of several different corrections may be used.

Conversely, the model which heads into the wind, has its sail combination too far aft. This condition is illustrated in Figure 12. It causes the aft end of the boat to be blown around with the wind. The corrections are just the reverse of those already given.

1. Move the whole sail combination forward. If an adjustable mast step has not been used, this sometimes is not the simplest correction.

2. The center of effort of the sail combination may be shifted forward by making a new and larger jib and decreasing the size of the mainsail accordingly.

3. The center of lateral resistance may be shifted by increasing the blade area of the rudder.

4. The area of the fin may be decreased by cutting away the forward end to shift the center of lateral resistance aft.

5. If feasible, a new fin which extends farther aft may be made which accomplishes the same thing in an even more marked degree.

The peculiarity, which some models have, of moving sidewise through the water, indicates that the model does not have sufficient submerged area to counteract the natural tendency of the wind to move an object in a straight line before it. The deeper the submerged body, the harder it is for the wind to move the boat sidewise. If a boat does not move sidewise, the sails can utilize the force of the wind. A model built with insufficient underwater body may be improved by increasing the size of the fin which may be made both longer and deeper.

Judging Drawings at Exhibits

Arthur R. Ayers

Chicago, Illinois

A method developed by the writer and a teacher of art, which gives aim and direction to the marking and judging of drawings placed on exhibition.

The judging scale shown herewith was developed with the hope that it would afford an accurate method of marking and judging drawings placed on exhibition.

After considerable thought and discussion with Miss Manion, of the art department, we divided drawings into six groups, based on the medium used in developing them. We also tried to place these on the chart in the progressive manner in which they are given to our students.

The next process was to establish the educational accomplishments acquired through motor or mental acquisition. This resulted in the divisions shown, as *originality, technique, composition, lettering,* and *comparative research.* We decided that *originality,* being the complete effect of knowledge acquired in our course, should be given first place with a maximum amount of points and equal to any sum of points given in another acquired field. There are, for instance, five points possible in the field of *technique.* The *originality* column is placed first on the chart because the judges' first thoughts are, "Is it original?," and

placing it first also encourages the student to develop any originality he may have.

In the next column, under *technique*, we have the five desired abilities receiving one point each for the recognized correct use and application of the different mediums. In this class you will note *smooth tones, texture, clean edges, legibility, variety of tone*, with their respective one point each, balancing the five points given the student for his possible originality.

The next column is *composition*. This is broken up into three parts of one point each. *Balance* — for the making and judging a picture or drawing as a picture. *Principality* — one point in the contrasting and focusing of attention to that particular thought expressed in the drawing. *Arrangement*— carrying one point, the logical sequence and location of those things for the necessary understanding of time, place, and utility.

The next column heading, *lettering*, is broken into three parts of one point each. *Spacing* — calls for one point and we thought this was very necessary so as to encourage the student to space his lettering by eye measurement, rather than by standard rules. *Legibility* — one point, so that correct use of small letters neatly done may be judged in a grade with those of larger dimensions. *Propriety* — carrying one point. Students are sometimes very lax in their selection of style in lettering when associating it with various types of work. Our idea was not only to express recognition of period lettering, but lettering carrying with it the spirit side of expression, such as ecclesiastical lettering in association with church work and, also, a style of lettering fit only for novelty recognition as such.

We also decided that neatness is a result of the advancement and growth in the divisions already mentioned, and our reason for not giving it a greater value was because when care of execution is really one of the most important factors in obtaining good drawing, we felt that neatness would automatically follow.

The last column is *comparative research*. This sounds rather collegiate, but after considerable thought and to avoid a possible heading as *copies*, we decided that all of those students who were unable to produce an original drawing should be classified in the *comparative-research* valuation, because they had evolved a drawing by comparing another work previously done by someone else with their own. The *comparative-research* point eliminates any student or drawing from the *originality* class and places him in Class B.

To show how this judging method is used, assume that drawing No. 4 of a student in Class No. 1 — pencil drawings — is to be judged. Assume also that it is an original drawing. Five points are, therefore, noted to the right of the figure four in the column marked *originality*. Assume that each of the points under *technique* is perfect, then one point is registered in each column below the words *smooth tones, texture, clean edges, legibility*, and *variety of tone*. The spaces to be used would naturally be to the right of figure four in the column marked *drawing numbers*. In *composition*, we find that the individual has a perfect score giving him one point each for *balance, principality*, and *arrangement*. Likewise under *lettering*, he may deserve a perfect score for *spacing, legibility*, and *propriety*, thus earning three more points. For *neatness* he received an additional point.

Since his work is original, he will receive nothing in the next column, *comparative research*, because this column is only for work copied from someone else. Now the judging is complete, and by adding horizontally across, a complete score of a Class A drawing is 17 points. Class A, of course, is the result desired because of the five points in *originality*.

Next, consider a Class B type of drawing, say a drawing which has been copied from one drawn by another artist. Assume that this drawing is No. 7 in the drawing exhibit. Since this drawing is not original, the *originality* column is skipped at once. Assume that his technique is perfect, then he scores a point under each of the five divisions in the *technique* column.

Composition, if perfect, nets another three points; *lettering*, if perfect, three points; *neatness*, one point; and being a copy drawing, he receives one point under *comparative research*. Adding this line horizontally for drawing No. 7, results in 5+3+3+1+1, making a total of 13 points, this representing a perfect score for Class B drawings.

If the individual has not the qualities necessary under each heading, the examiner, of course, will leave some of the spaces blank, thereby lowering the possible score. This fact gives an opportunity not only to judge the drawings, but also to note at a glance, whether there is a weakness in the classwork. This method of marking also permits the student to recognize his shortcomings.

While the examples showing the use of the judging method have been drawn from work done in the art classes, the teachers of mechanical and architectural drafting may readily see how to apply the scheme to their own work.

CLASS	DRAWING NUMBER	ORIGINALITY 5 POINTS	TECHNIQUE 1 POINT EACH: SMOOTH TONES	TEXTURE	CLEAN EDGES	LEGIBILITY	VARIETY of TONE	COMPOSITION 1 POINT EACH: BALANCE	PRINCIPALITY	ARRANGEMENT	LETTERING 1 POINT EACH: SPACING	LEGIBILITY	PROPRIETY	NEATNESS 1 POINT	COMPARATIVE RESEARCH 1 POINT	TOTAL SCORE
No. 1 PENCIL DRAWINGS	1															
	2															
	3															
	4															
	5															
	6															
	7															
	8															
No. 2 PEN and INK DRAWINGS	1															
	2															
	3															
	4															
	5															
	6															
	7															
	8															
No. 3 COLOR BRUSH - PEN PENCIL	1															
	2															
	3															
	4															
	5															
	6															
	7															
	8															
No. 4 MECHANICAL ARCHITECTURAL DETAIL DRAWINGS	1															
	2															
	3															
	4															
	5															
	6															
	7															
	8															
No. 5 MECHANICAL ARCHITECTURAL PLANS, ELEVATIONS	1															
	2															
	3															
	4															
	5															
	6															
	7															
	8															
No. 6 COMPOSITION WASH DRAWINGS	1															
	2															
	3															
	4															
	5															
	6															
	7															
	8															
PERFECT SCORE, CLASS A (ORIGINAL WORK) 17																
PERFECT SCORE, CLASS B (COPIED WORK) 13																

That Confusing "Side View"

August Flam

John Marshall High School, Los Angeles, California

The author pleads for agreement in the use of terms. The reader may not agree with the suggestions contained in this article, but the agreement on terms would simplify the subject of mechanical drawing very much.

In referring to the different views of a figure in mechanical drafting, pupils, and often instructors, and authors, too, use the expression *side view* loosely. Regardless of where used, the term *side view* is always perplexing. For, are not really *all* views of a figure *side views?* And can we not take as many views of a figure as it has sides? Indeed, some authors refer to the *top view* as the "top side view," and to the *front view* as the "front side view."

The *side view* is not clarified in texts. On the contrary, there seems to be no general agreement among even those who are expected to know — the teachers and authors. Of course, the problem of naming the views under such circumstances presents staggering difficulties to students.

Why cannot mechanical-drawing teachers come to some agreement to clarify the situation? After all, ours is a universal language in the same degree as is mathematics, and, as such, our definitions should be characterized by clearness.

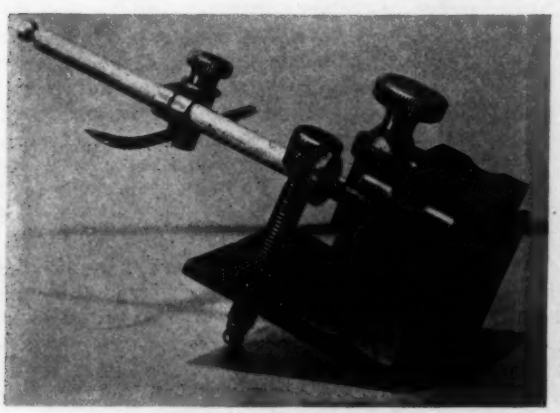
As a constructive suggestion, let us agree to call the main — the most important, and the most complicated — the largest view of our figure the *front view*. There may indeed be some division of opinion as to which side should be selected for this main view, but once we have made our choice, let us label it our *front view*, and keep it that and nothing else. Then, a view taken directly from above, and drawn directly over the front view, we must call the *top view*. The view which is usually taken from the right end should then be termed the *end view*. There is no room left for the *side view*. That term should be booted out of drafting terminology once and for all, and no loss. We need greater clarity — fewer complications.

Problems and Projects

CRADLE FOR SURFACE GAUGE

Frank Muir, Hamilton, Ontario, Canada

Almost every machinist has experienced the need at times for two surface gauges to use on one job. As these tools are rather expensive, besides being heavy in the tool box, the idea shown in the illustration presented itself to the writer. It may be of interest to others.



Surface gauge in cradle

The device is a cradle made of angle iron or of flat steel bent up at right angles, and tapped for a ball-end knurled screw.

When two dimensions have to be scribed the highest one is set with the surface gauge upright as usual and the lower one with it laid in the cradle the height adjustment being obtained with the knurled screw. If this does not afford sufficient adjustment place the surface gauge upright in the cradle.

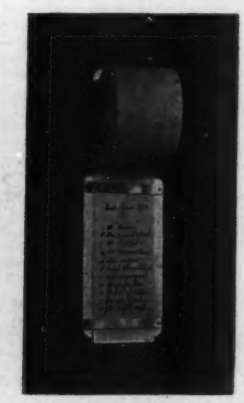


Fig. 1

KITCHEN MEMO

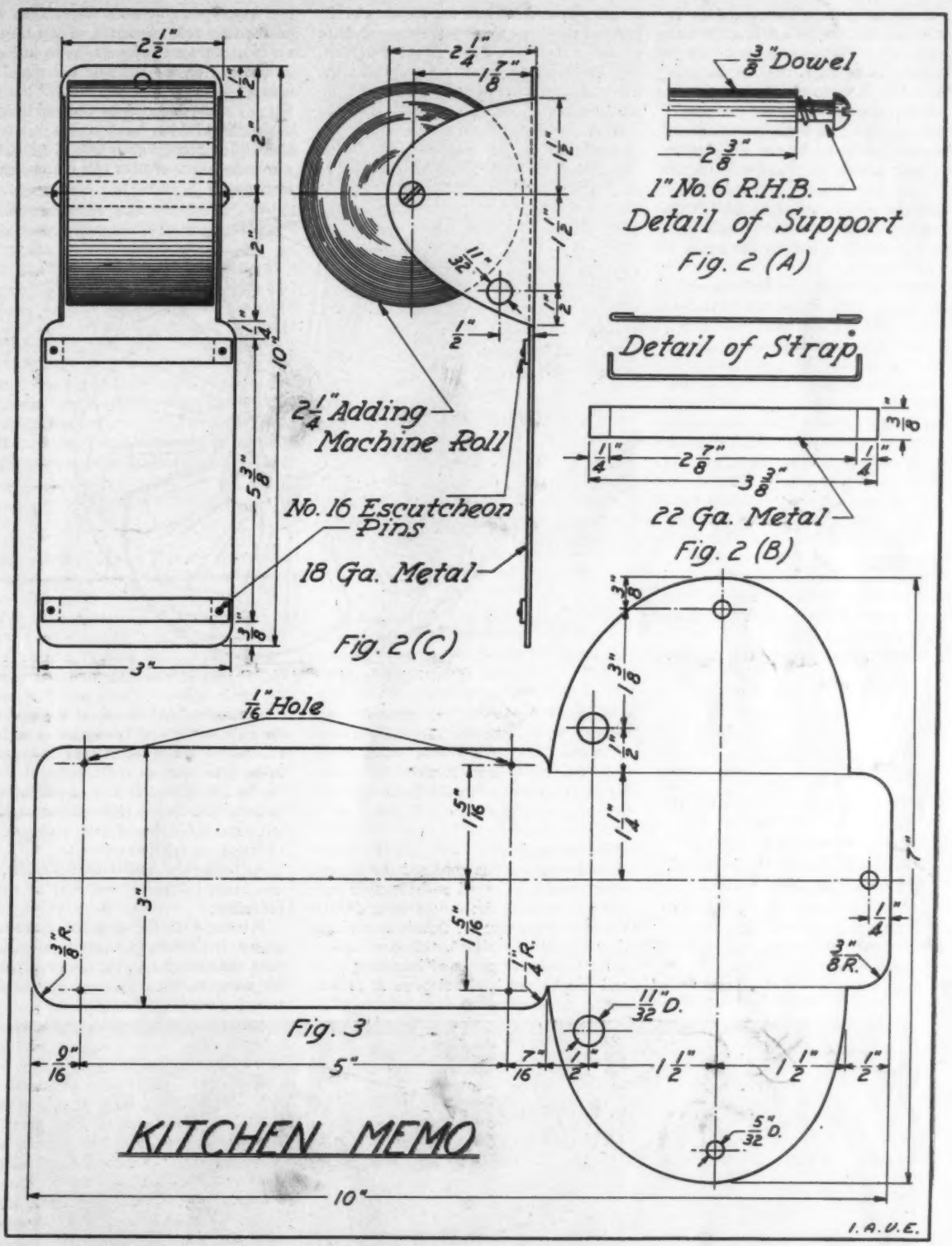
Dale E. Mansperger, High School, North Olmsted, Ohio

The kitchen memo is a very practical and an inexpensive article which may readily be made by beginning pupils in the metalworking unit of the laboratory of industries. When it is necessary for pupils in industrial-arts classes to pay for all of the materials which they use in the construction of projects, the demand for a practical project becomes more evident.

This article has a direct appeal to the parent since it may well help keep the records of the kitchen in a more systematic manner. Even though it was designed for use in the kitchen, it may also be of value on the telephone stand.

Details of Construction and Use. The paper supply on the memo is neatly and compactly arranged, and, with ordinary usage, will last for two or more years. The rack which supports the paper roll may be made to satisfy individual taste, i.e., it may be enameled to match the color scheme of its surroundings, or it may be left in its natural color. Either aluminum or brass look well when the metal surface is polished. If the rack is made of one of these metals, 14-gauge metal should be used. The kitchen memo shown in Figure 1, is made of aluminum and left natural. If the rack is enameled, it should be made of 18-gauge sheet iron. The memo may be hung on the wall or it may be placed in a drawer in a convenient place.

Since the metal from which the rack is made is rather thick, it is a bit difficult to cut along the layout lines. The softer metals may be cut quite readily with a jig saw if the necessary attachments are available. If this machine is not found in the laboratory, a pair of heavy tin snips will be necessary.



It may be desirable to use a cold chisel in a few places.

All of the materials which are used in the construction of the kitchen memo are shown in Figure 2. Some of the necessary steps are suggested by the details shown. The 11/32-in. holes just below the paper roll are for the pencil so that it is easily accessible when needed.

Procedure

1. Follow the dimensions given on the *sheet-metal layout* in Figure 3, and lay out the pattern on a piece of sheet metal in a position so that there will be the least possible waste. All straight and irregular curved lines in the outline for the rack should be marked with a scratch awl or scriber. All arcs should be marked with a pair of dividers.

2. Mark the position for all the holes on the rack with a center punch.

3. Cut out the pattern. Follow the line as closely as possible, but do not touch it with the rough cut. Place the metal in a vise so that the edge to be cut is close to the jaws. File the metal down to the line.

4. Select twist-drill bits of the proper sizes and bore the two holes for the pencil support, the two holes for the roll support screws, and a hole for mounting on the wall.

5. Cut the two strips of metal for the guide straps. Follow the dimensions given in Figure 2. Bend the ends of the straps as shown in Figure 2.

6. Smooth the edges of the straps with a file and emery cloth. Polish the metal rack before the sides are bent up.

7. Place the rack on a piece of angle iron so that the bending lines fall along the sharp corner of the angle. Clamp it in place and bend the two sides of the rack to an angle of 90 deg. with the back. Use a mallet to start the bend and finish the square corner with a ball-peen hammer.

8. Measure the distance between the two sides of the rack at the base, and cut a dowel pin to that length. Locate the center of each end of the dowel pin and bore holes for the screws.

9. Clamp each strap in its proper position. Center and bore 1/16-in. holes ⅛ in. from each end of the strap. Countersink the holes slightly from the back.

10. Finish the surface of the metal as desired.

11. Use escutcheon pins for rivets to fasten the straps in place. Mount the paper roll. It will be necessary to tighten both of the screws in the dowel pin at the same time in order to keep the pin from turning.

REWINDING AN ARMATURE

(A Project for the Automotive Laboratory)

R. F. Jennings, South High School, Minneapolis, Minnesota

Rewinding a generator armature is exacting work requiring patience. However, it is not difficult once one understands the pattern of the winding.

The first step is to strip the armature of all old wire and to clean out the slots in the commutator bars. From this stage on, there are three main points to bear in mind. First, all wire must be kept from touching the armature core by providing adequate insulation. Second, each coil must have the correct number of turns placed in the proper slots in the armature core. Third, the ends of each coil must be connected to the right commutator bars.

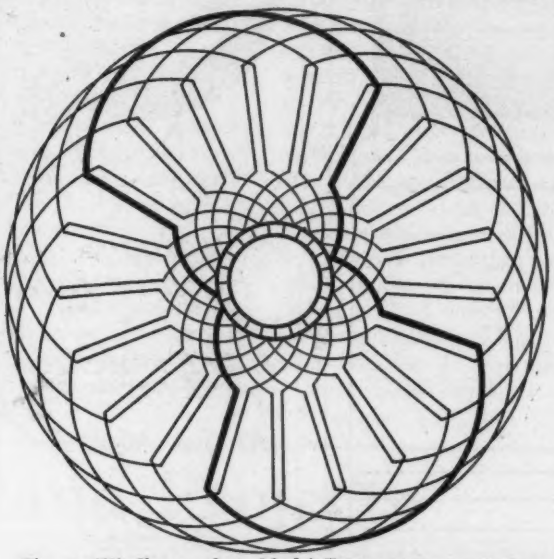


Fig. 1. Winding used on Model T generator armature

Figure 1 shows the retrogressive wave winding used on the old Model T generator armature.

As shown in Figure 2, pieces of insulating paper (fish paper) cut ⅛ in. longer than the slots, are folded once and placed in the slots.

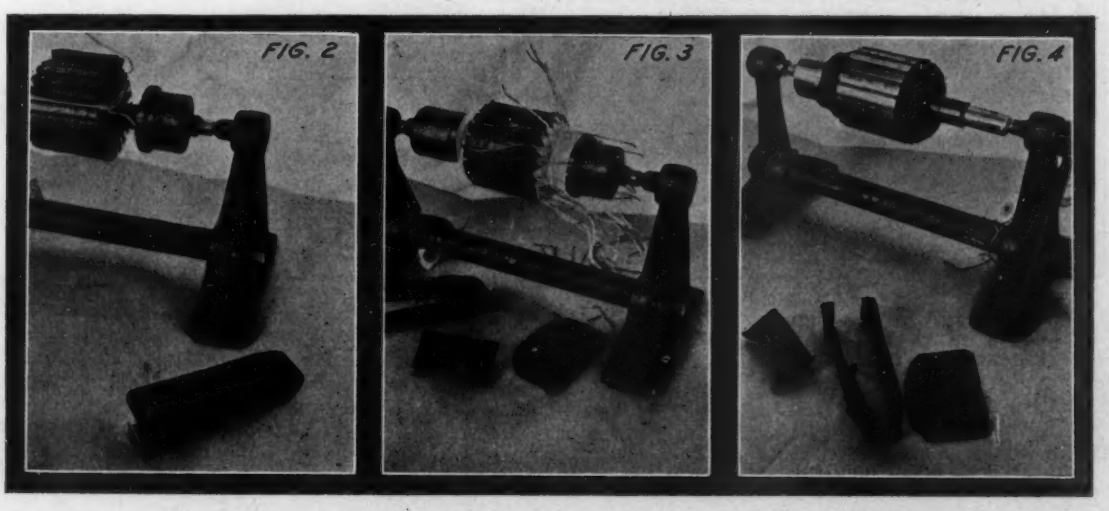
Before winding the first coil, the portion of shaft between the core and the commutator should be taped with friction tape. See Figure 2. If the slotted fiber disks at the ends of the core are damaged or missing they should be replaced with new ones.

Next fold two pieces of insulating paper and insert them in the slots so as to leave four empty slots between them. Then wind on the first coil, consisting of ten turns of s.c. No. 18 magnet wire, as shown in Figure 2. The end on the left side is scraped and inserted in the proper commutator bar (see Fig. 1) while the end on the right side is folded back. After each coil is wound, it should be packed tightly into the slot with a rounded piece of fiber like the one shown in Figure 4.

The second coil is wound in the slots to the right of the first (commutator end nearest operator), and the ends or leads handled in the same manner as the first coil, the one to the left placed in the commutator bar, and the one on the right folded back. The left-hand leads should have sufficient slack to touch the friction tape.

All coils are wound exactly alike, each one being placed to the right of the one preceding.

Starting with the sixth coil, there will be two coils to the slot. As each slot is filled with the second coil, the fiber retainers can be inserted. These show plainly in Figure



4 and consist of strips of 1/16-in. thick fiber cut a trifle shorter than the length of the slot, and 1/16 in. wider. They are driven in from the top with a copper hammer. By thus forcing the fiber into the slot, the protruding ends of the insulating paper are sheared off, and the fiber is held tightly in place.

When the last coil is wound, the space on top of the lower leads should be filled in with ½-in. wide cotton tape as shown in Figure 3.

Next, a collar made of insulating paper is wrapped around the cotton tape. This collar is made by first making a washer with an outside diameter of 6¼ in. and an inside diameter of 4⅜ in. from insulating paper, and then cutting it in half. This forms two collars. The upper leads are laid down over the collar to their respective commutator bars. See Figure 1.

All leads can now be soldered to the commutator bars using paste flux and a large soldering copper.

As shown in Figure 4 a layer of twine is wound over the top leads next to the commutator.

The windings should now be thoroughly saturated with orange shellac or a good grade of insulating varnish and dried, preferably in an oven.

When the armature is dry, the commutator is turned smooth on a lathe, using a pointed tool slightly rounded with an oilstone. For best results, a high speed and slow feed should be used. Fine (6/0) sandpaper should be used for polishing.

The last step is undercutting the mica between the commutator bars to a depth of 1/32 in. This can be done with a hack-saw blade ground to the same thickness as the mica.

IMITATION MARBLE PROJECTS

D. V. Middleton, Central Junior High School, Kansas City, Missouri

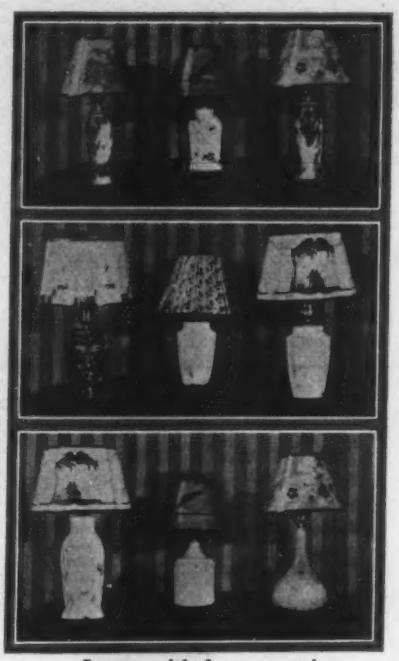
How Glass Jars Are Used for Forms

The increasing demand for articles made from Keene's cement for Christmas showed that more forms would be needed at once.

A glass jar was experimentally used as a form for making a table lamp. This jar had a longer neck than was thought suitable, so several rounds of string were tied around it at the place where it was to be cut. This string was then soaked with kerosene, and ignited. When the flame died, the glass was submerged in cold water. The glass cracked at the desired place, and a light tap with a hammer broke off the neck evenly.

The jar was then filled with a mixture of Keene's cement tinted a rose color. A ⅛-in. pipe threaded at one end was next put down in the center of the cement, with the threaded end projecting about ½ in. at the top.

The next day, in removing the jar from the cement, the string method was again used to crack the jar around the middle. A little tapping with the hammer broke the glass off without any trouble.



Lamps with bases cast in glass forms

The surface of the cement was found to be very smooth, and it had hardly any air holes. This extreme smoothness, together with the advantage that one can see through the transparent glass just how the color combinations are blending, makes the glass jar a much more satisfactory form than a wooden or metal one. After letting the cement dry a day, the lamp was rubbed with pumice stone on a damp cloth. Then, when the surface had dried, it was again rubbed with a cloth. This imparted a very beautiful luster without requiring any other finish.

The students at once started to bring in glass jars of all shapes and sizes, and more than 100 lamps of different shapes and sizes were made in a very short time. The illustration shows some of them.

Vases also were made by using a small jar inside a larger one. In these cases the small jars were left in the cement to prevent the vases from leaking.

The most popular color combination used was white streaked with brown. Other combinations were white streaked with black, rose, or green; black streaked with white; rose streaked with white; and plain colors of white, rose, and green.

HORSEPOWER

Michael Evancho, Connelley Trade School, Pittsburgh, Pennsylvania

"Power" and "work" are two mechanical terms which are often confused or used incorrectly. The term "work" in physics means the overcoming of resistance. For example, when we carry a weight of 20 pounds up a flight of stairs 10 feet high, we do 200 foot-pounds of work. The amount of work done is found by multiplying the weight in pounds by the distance moved in feet. A foot-pound is the work done in raising 1 pound a height of a foot, or it is the force of 1 pound exerted over a distance of 1 foot in any direction. The amount of work done would be the same whether we did this in 1 minute or in 1 hour, but the amount of power required to do this job in 1 minute would be 60 times the power required to do it in 1 hour. Work, therefore, is the product of the force necessary to overcome resistance times the distance through which the force is applied. Power, on the other hand, means the rate or speed of doing work.

Before the days of the steam engines, horses were used to operate machinery. As engines replaced horses, they were rated according to the rate at which they could do the work as compared to the horses which they replaced. It was found that a strong dray horse working for a short time could do work at the rate of 33,000 foot-pounds per minute, or 550 foot-pounds per second. Their rate of doing work was therefore expressed in horsepower.

Taxable or N.A.C.C. Horsepower*

There is no relation between the horsepower developed by an engine and the taxable or N.A.C.C. horsepower (sometimes incorrectly referred to as S.A.E. rating). The taxable horsepower is only a calculated value and is obtained by the following formula:

$$\text{Taxable h.p.} = \frac{D^2N}{2.5} \text{ or } .4\ D^2N$$

in which D is the diameter or bore of cylinder in inches, and
N is the number of cylinders.

Illustrative Problem

Find the taxable horsepower of a 1935 Hudson big 6 with the following specification, where $D = 3''$ and $N = 6$.

$$\text{Taxable h.p.} = \frac{D^2N}{2.5} =$$

$$\frac{3 \times 3 \times 6}{2.5} = \frac{54}{2.5} = 21.6 \text{ h.p.}$$

Solving by the second method, we proceed as follows:

$$\text{Taxable h.p.} = .4\ D^2N =$$
$$.4 \times 3 \times 3 \times 6 = 21.6 \text{ h.p.}$$

The taxable-horsepower formula was accepted as a standard for 4-cycle single-acting engines at a piston speed of 1000 feet per minute, and a mean effective pressure of 90 pounds per square inch. Since the piston travel of the 1935 cars is more than double, and in some instances more than triple the speed at which the above formula was accepted, and since the mean effective pressure has changed from 90 pounds to 130 pounds per square inch in cars equipped with superchargers and high-compression heads, it will be readily seen that this formula is not altogether

*This formula was originally adopted by the A.L.A.M. (Association of Licensed Automobile Manufacturers) which at the expiration of the Selden Patent merged with the nonlicensed Manufacturers Association into the N.A.C.C. (National Automobile Chamber of Commerce).

accurate as to the actual horsepower developed. However, it is used for estimating approximate horsepower as well as in the purchasing of license plates in some states.

The State of Pennsylvania licenses its passenger cars according to the following:

1. All passenger cars under 25 horsepower are assessed the minimum fee of $10.00.

2. Car with an N.A.C.C. rating of more than 25 horsepower are assessed the sum of $0.40 for each additional horsepower or fraction thereof.

Illustrative Problem

Compute the license fee required by the State of Pennsylvania for a 1935 Hudson 8 whose taxable horsepower is 28.8.

Fee for first 25 h.p.	$10.00
Fee for 3.8 or 4 h.p. ($4 \times $0.40 = $1.60)	1.60
Total amount of fee required for license plates for a 1935 Hudson 8 in the State of Pennsylvania.	$11.60

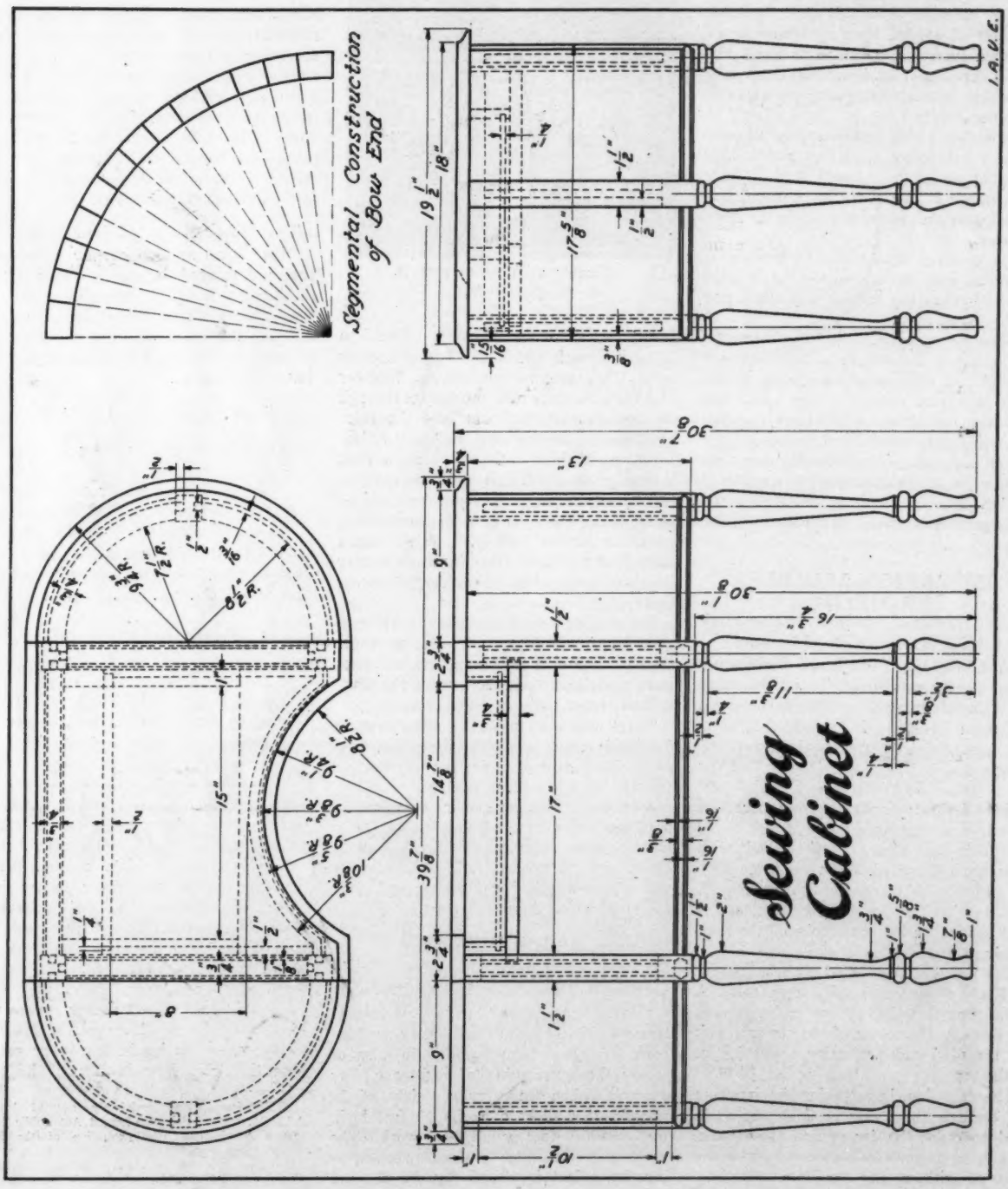
SEWING CABINET

J. J. Sasser, High School, Sour Lake, Texas

This project was originally designed to combine the old-fashioned lapboard with the sewing cabinet of today. Later it was constructed to include the console table.

This project is very interesting for advanced students in woodwork, because it involves the use of many different machines.

The legs are turned on the lathe, and in so doing, the student makes use of all the different turning tools.



The bow-end construction requires 13 pieces, glued together. In making the ends, the surfacer, jointer, rip and crosscut saws are used. The bow ends are tongued and grooved into the legs, making a very good problem in joinery.

Water stain, followed by a coat of filler, is used for the finish. Two coats of shellac are applied after the filler, to prevent the water stain from bleeding. Each of the shellac coats must be carefully rubbed down with pumice stone and oil. Then two coats of varnish are applied, each coat being rubbed down with pumice stone and oil.

MINIATURE LOG CABIN

Z. S. McIntosh, Montezuma School for Boys, Los Gatos, California

This miniature log cabin was made for the Christmas-table centerpiece. It is made of ½ in. hazel sticks. However, willow, elderberry stalks, redwood shoots, or the switches from trees native to different parts of the country will do. The material should be gathered in the early fall, put on a rack to dry, ready for use by the middle of November.

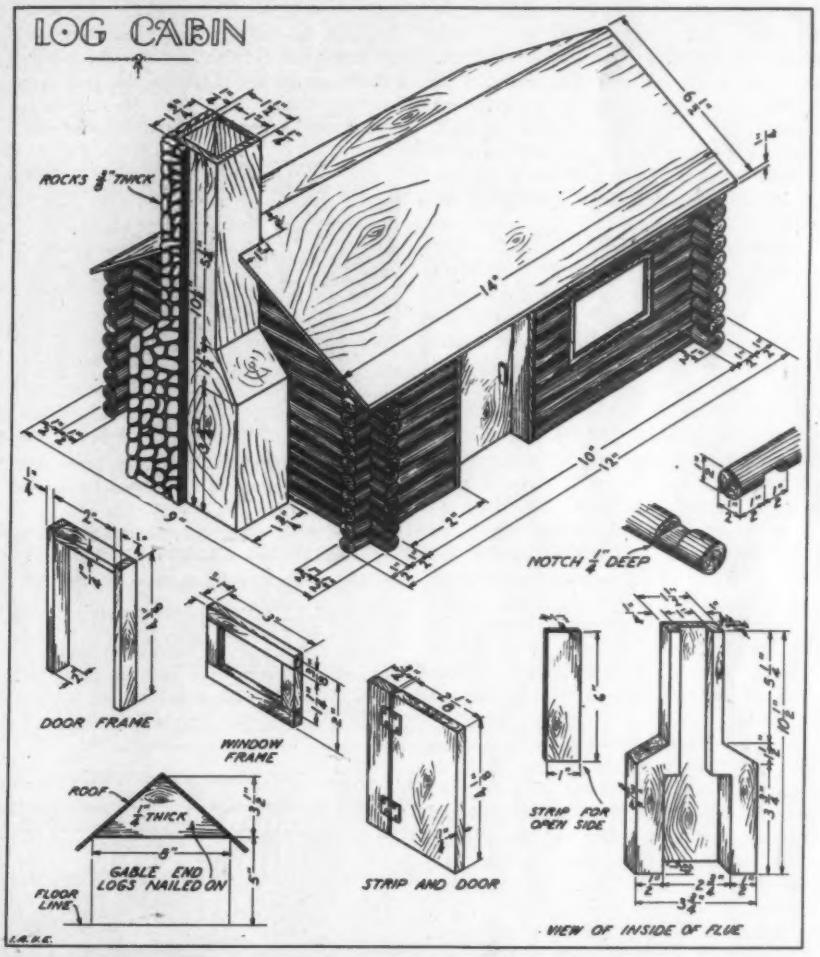
The most pliable material is the elderberry stalk, which is usually long, straight, and requires less time and energy in construction than hard wood. But on the other hand, a cabin made of the close-grained wood is more substantial, holds the nails firmer, and takes a finer finish.

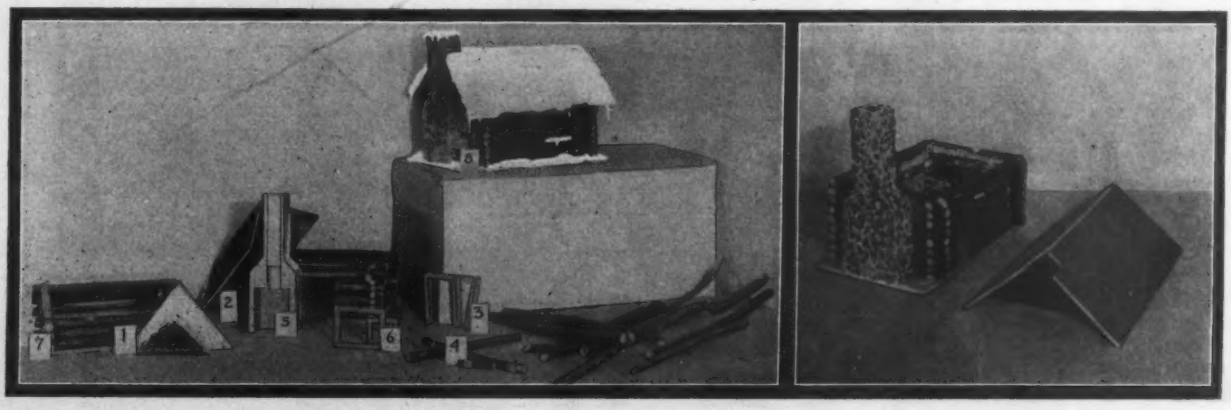
Each pupil should collect his quota of sticks. The class then exchanges with one another to obtain pieces of uniform diameter for the various houses. Sticks of ¼-in. diameter are suitable for cabins proportioned from 7 by 10 by 5 in. up to 10 by 13 by 6 or 7½ in. For the larger sticks, increase the dimensions of the cabin.

The Floor. Cut a piece of material ¼ in. thick for the floor which will allow for the ends of the logs to project over the edge ½ in. except at the back end which should be about 3 in. longer to serve as a base for the chimney.

Construction of Walls. Locate the spaces for the door, windows, and fireplace on the floor. Select a sufficient number of straight pieces for full length where no openings are to be made. Cut, fit, and notch the first layer of logs, leave the openings for the door and fireplace, then nail firmly to the floor with 2d blue nails or brads of similar size.

If the notches are to be made with a handsaw, put the stick on a bench hook, and with the backsaw cut half through, ½ in. from the end. The second cut is made the width of the overlapping stick, away from the first one. Be careful to keep the notches straight and on the same side of the stick. On the end of the stick that is not to be notched, keep the ends perfectly square which form the sides of the door, windows, and fireplace. Build up the frame one layer at a time. Make the opening for the fireplace 3 logs high, and above that height extend the sticks straight across. Put the windows between the third and eighth logs. Make the door 7 logs high. If a window is put on the same side with the door, build-in that space with short pieces. Before the top layer is put on, the





Parts: 1. gable end. 2. roof; 3. door and frame; 4. notched logs; 5. chimney; 6. window frame; 7. foundation logs; 8. house

ends of the two upper cross sticks must be cut on the same angle as the pitch of the roof. If a hand screw is clamped over the side sticks, the logs are held firmly in place and easily nailed.

The Roof. Cut two triangular pieces of 3-ply board for gable ends to fit the pitch of the roof. The roof may be either steep or nearly flat. The base of the triangle is the same length of the end logs, less the projection over the sides. Cut the two pieces for the roof from any ¼-in. material, bevel, and nail the edges together. Fit the ends to the house and the roof, but do not nail in yet. Cover the gable ends with sticks, nail on firmly, and then saw off the ends which extend over the edges. This method saves time and makes a neat piece of work. Next, nail the gables to the roof, but do not fasten the roof to the house. If a small light or decorations are to be put inside, a removable roof facilitates the work.

Chimney. The chimney is made of a piece of soft pine, 2 by 4 by 12 in. From each side rip off a strip about 1 in. wide and 6 in. down. Slope off to make the shoulders. To hollow out the center of this piece, rip in ¼ in. from the sides and down to within ¼ in. of the back. Chisel out the inside. A larger space may be chiseled out at the bottom to make room for fire logs and a droplight down the chimney. At the top of the open side, insert a strip of 3-ply which should extend below the top log. Nail the chimney to the house from the inside and through the bottom of the floor board. In order to make the projection at the back fit the chimney, line the roof with the sides of the house, mark the edge at points of contact with the chimney, and saw out each side of the roof end to the logs on the gable.

The outside of the chimney is finished with tiny flat rocks or pebbles, held in place with a cement made of 2 parts of salt and 1 part of flour. The paste should be thick enough to adhere to the wood and spread readily over the surface. Put on a coat about ¼ in. thick and into this imbed pebbles to resemble a stone fireplace. The back and the front of the chimney may be plastered at the same time if the house is stood on end until the cement sets and sides treated in the same manner, otherwise the rocks will slide off if the chimney remains in a perpendicular position.

Windows and Doors. The window frames, cut out of scraps of 3-ply are ⅜ in. wide and just fit into the openings. The doorframe is made of three pieces of strips the width of the logs and nailed firmly to the ends and the top. The door is made wider than the frame, hinged to a strip the same length about ¾ in. wide which is nailed to the logs on the inside. This method permits the door to swing freely and is not difficult to put on.

Finishing Touches. Use clear or colored cellophane for window glass. After the windows are placed, chink up the cracks between the logs with cement. When thoroughly dry, shellac inside and out. Put cotton on the roof for snow. A small droplight may be put down the chimney to make the yule logs glow, or a small candle or a tiny wick in a dish of oil bespeaks of Christmas cheer. Put a bolt on the inside of the door and a latchstring on the outside as a symbol of hospitality.

BEDROOM CHAIR MADE FROM A NAIL KEG

Herbert Bast, Sheboygan, Wisconsin

Children especially will enjoy this novel chair. It is made from an ordinary nail keg which was obtained for the asking from a hardware store. Carpenters also give them away at times. This chair is substantial enough to be used as an occasional seat.

Nail-keg chair

It is useful for storing darning, sewing, or children's articles. It may even be looked upon as ornamental when the cover is matched with other color combinations in the room.

The cover may be made with cretonne, chintz, or sateen.

Method of Procedure

Nail a strip of tin or wire around the keg 11 in. from the bottom. This will prevent the keg staves from opening when the top wires are taken off.

Cut the keg 12 in. from the bottom, leaving about 13 in. of wood on for the back.

Fit in a piece of ¾-in. wood for the rear part of the seat. The front part of this piece should rest on top of the keg for about 1 in. on each side. Cut the front part of the seat the same shape as the keg. This piece is to project 1 in. over the side.

Cover the lower part of the keg with muslin or cambric.

Nail the rear part of the seat into place.

Pad this portion of the seat, also the front of the back, with cotton felt and draw over the desired cover. Tack a piece of cover to the rear back. It should be covered low enough to be even with the skirt that is put on all around.

Pad the front seat the same thickness as the rear seat, and attach it to the rear seat with hinges.

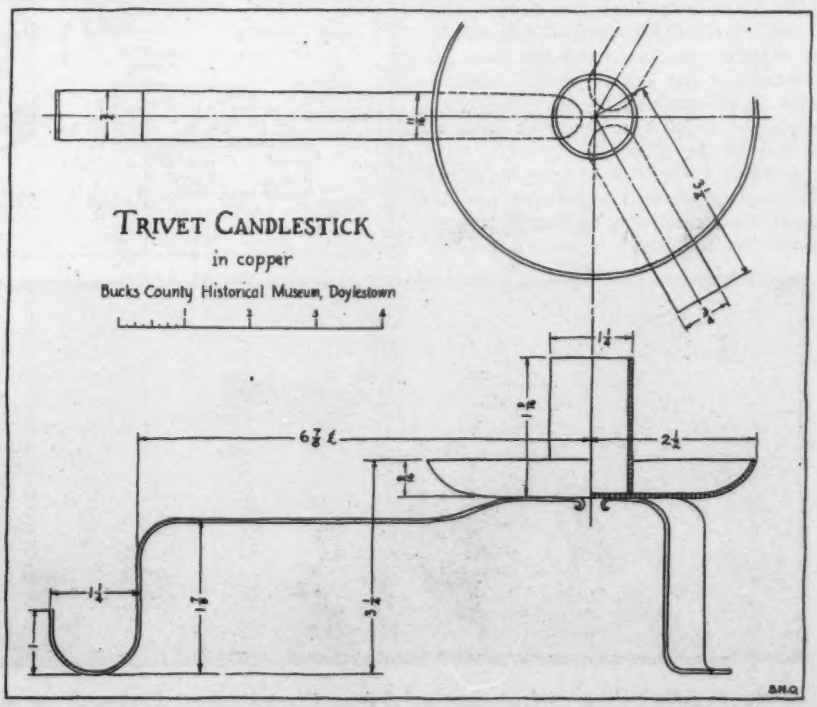
The skirt may be pleated or shirred all around, and should be ¼ in. from the floor.

PAGES FROM A MUSEUM SKETCHBOOK

Burl N. Osburn, State Teachers College, Millersville, Pennsylvania

Trivet Candlestick

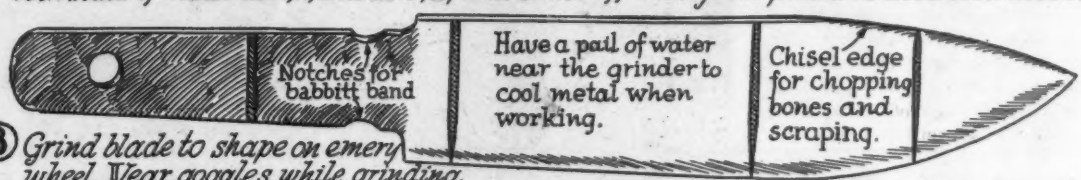
The age of this unusual form of candleholder is difficult to determine. It consists of the socket and bowl, supported by three feet, one of which is extended to form a handle. The metal is unusually heavy for these articles, being about a 14 gauge. The socket is quite large, made probably for a dipped candle. Dimensions are approximate, since the original is somewhat out of shape.



CAMP KNIFE

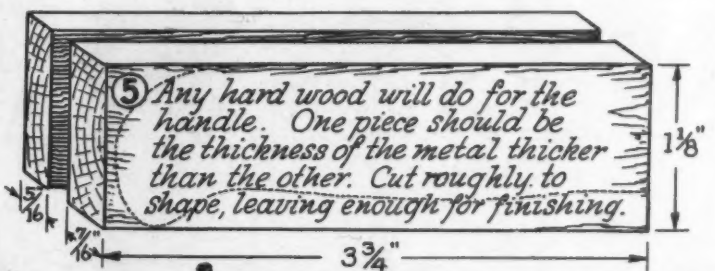
① Use piece of hack-saw blade 1¼" wide. Make a template of wood or cardboard the shape of the desired knife blade.

② Mark off shape of template on the saw blade with a colored pencil. Break saw blade to desired length by clamping knife part in a vise and striking the projecting part a sharp blow with a hammer. Then grind groove with edge of emery wheel on both sides of blade at A,A, and at B,B, and break off triangular pieces as described above.

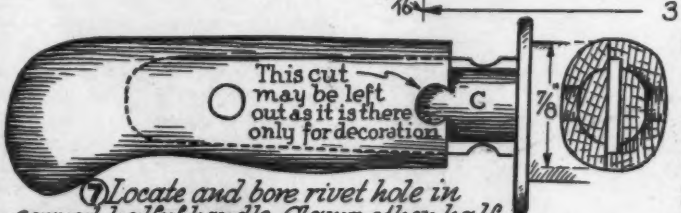

Notches for babbitt band
Have a pail of water near the grinder to cool metal when working.
Chisel edge for chopping bones and scraping.

③ Grind blade to shape on emery wheel. Wear goggles while grinding. Do not burn steel. When it turns blue or brown it is too late. Taper sides of blade as is shown in the sections on a sanding disk faced with emery, carborundum or garnet cloth. Polish the blade by laying it flat on a piece of wood and rubbing it with emery cloth, using plenty of oil.

④ Guard made of 3/32" brass. Cut slot to fit snugly.



⑤ Any hard wood will do for the handle. One piece should be the thickness of the metal thicker than the other. Cut roughly to shape, leaving enough for finishing.

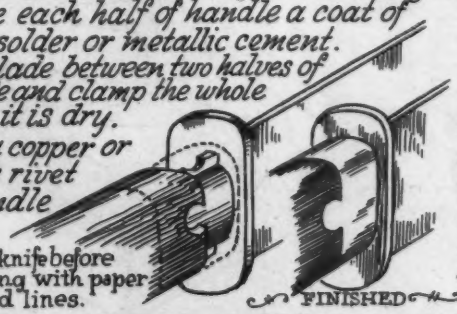


⑥ Slip guard into place and lay tang on the thicker half of handle. Draw line around it and with a knife and chisel carve out so that the tang fits in flush. Then cut away forward end as shown at C. This forms the groove for the babbitt.

⑦ Locate and bore rivet hole in carved half of handle. Clamp other half in place and bore that using first hole as guide.

⑧ Give each half of handle a coat of cold solder or metallic cement. Put blade between two halves of handle and clamp the whole until it is dry.

⑨ Use a copper or brass rivet in handle



⑩ Now take a strip of heavy wrapping paper and wrap it around handle, being careful to have it fit snug at the guard and around the wood. Fasten the end with glue. Then carefully cut a hole thru the paper just large enough to pour babbitt thru. Melt hard babbit in small ladle. Warm the knife at this section and pour babbitt. After babbit has cooled, finish entire handle with file and sandpaper. Use oil, shellac, or varnish as a final finish.

MARBLED PENHOLDERS

Jos. J. Lukowitz, Milwaukee, Wisconsin

On page 261 of the August, 1934, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION there appeared an interesting project entitled "A New Penholder" by Frank Slepika.

Figure 1, shown herewith, illustrates a copy of this project with slight variations in the dimensions. The purpose of repeating this project is to call attention to a very appropriate new finish and to illustrate some interesting variations in the form of such penholders.

At A, Figure 2, is shown a sphere which is used as a part of the penholder. The sphere may be turned on a lathe and it may, of course, be a little larger or a little smaller than 2¼ in. Wooden spheres also may be obtained at times from old discarded pieces of furniture, or from spindled archways in old homes being remodeled or wrecked. At B is shown another variation with a circular disk for a base. At C is shown one with a groove, for a pencil. If no lathe is available for turning the cylin-

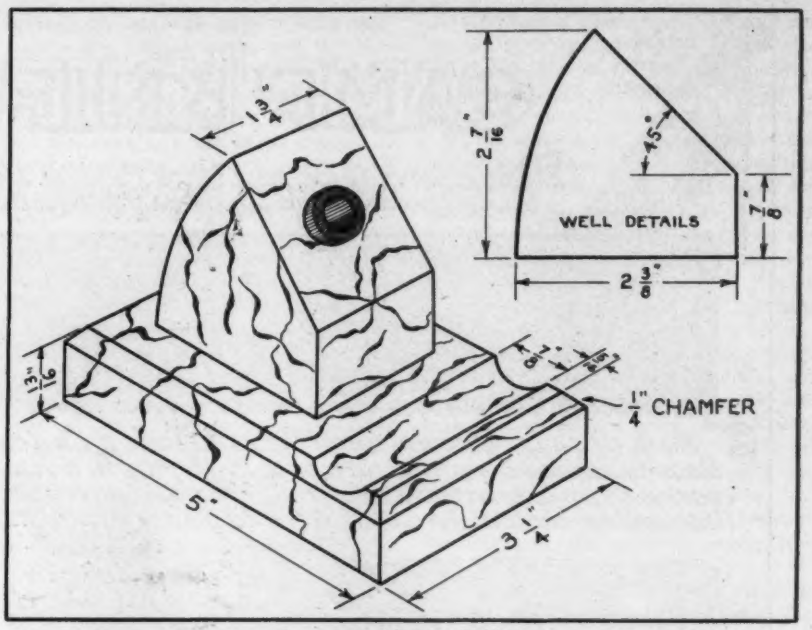


Fig. 1. Marbled penholder

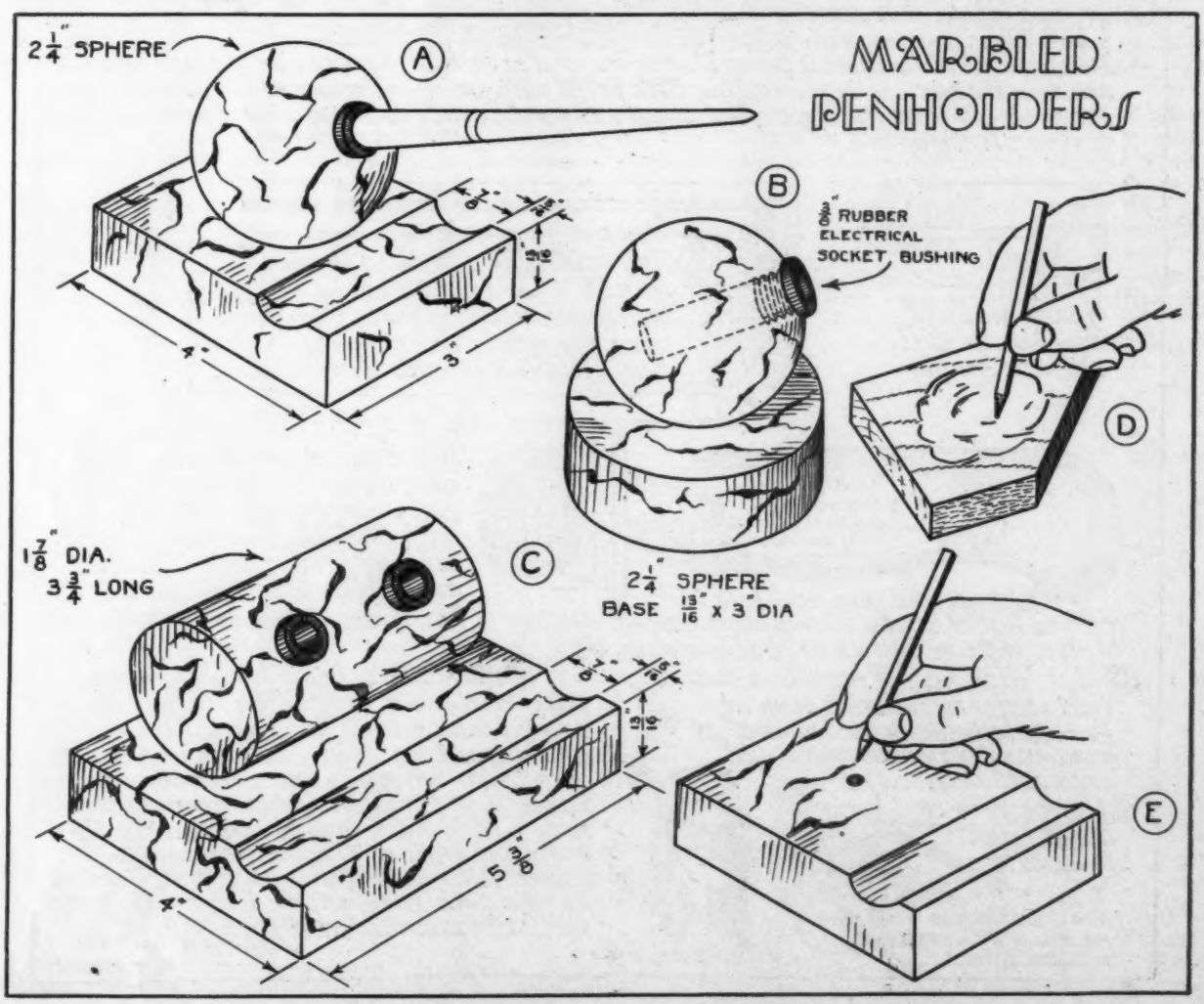


Fig. 2. Different shapes used for the marbled penholders

der, it can easily be made by hand from a square block.

To do this, proceed as follows: Lay out a circle of the proper size on each end of the block and then plane the corners off the block, thus forming an octagon. Next plane the new corners formed, and repeat. In this way, an approximate cylinder will be formed which, when sanded, should be perfectly round. The bases of the penholders shown at A, B, and C in Figure 2, have their top edges rounded with a ⅛-in. radius.

At B in Figure 2, is shown how the ⅜-in. rubber bushing is screwed into a hole bored into the sphere. Bore the hole slightly smaller in diameter than the outside diameter of the threaded portion of the bushing. Then cut the thread in this hole by screwing a piece of threaded ⅜-in. pipe into it. Fasten the parts of the penholder together with a screw through the bottom of the base.

Finishing

Before finishing, separate the parts so that the finishing can be more readily done. First give the penholder a thin priming coat of shellac. When thoroughly dry, sand with very fine sandpaper and give it two coats of enamel.

When the second coat of enamel is thoroughly dry, the marbled effect can be obtained as follows: Place a little daub of cream-colored enamel on a small piece of scrap wood. Then, with a small stick of wood, about the size of a match sharpened to a blunt point (about 1/32 in. diameter), make the markings on the penholder as shown at E, Figure 2. A great many effects can be obtained by using different colors and combinations of colors for the streaking or marking. For example, instead of using black for the background, green can be used with a marking of lighter green and a little yellow here and there. White may also be used for a background with markings of gray.

A very small paint brush may be used for the striping, but a stick is preferred because the width of line is easily regulated, as the stick makes firm contact with the wood whereas a small brush in the hands of a boy will be subjected to varying pressure, thus producing lines with many variations of width.

There are, of course, other ways of imitating marble, but this method is perhaps the most foolproof under school-shop conditions, especially with young boys. When the striping is dry, assemble the penholder, insert the bushing, and cover the bottom with felt or a piece of blotter.

READING LAMP

W. L. Dorrance, Whittier Junior High School, Lorain, Ohio

The reading lamp shown and described herewith has proved to be a most popular project. The design is simple yet pleasing, and the construction requires but few tools. Since the amount of material used in the lamp is small, it is desirable to get one of the better cabinet woods, such as black walnut.

Figure 1 shows the general construction of the lamp. The post is glued up of two pieces which have been gouged out to carry the cord. The hole for the arm which holds the shade may be cut out before the post is glued up, or this operation may be left until later.

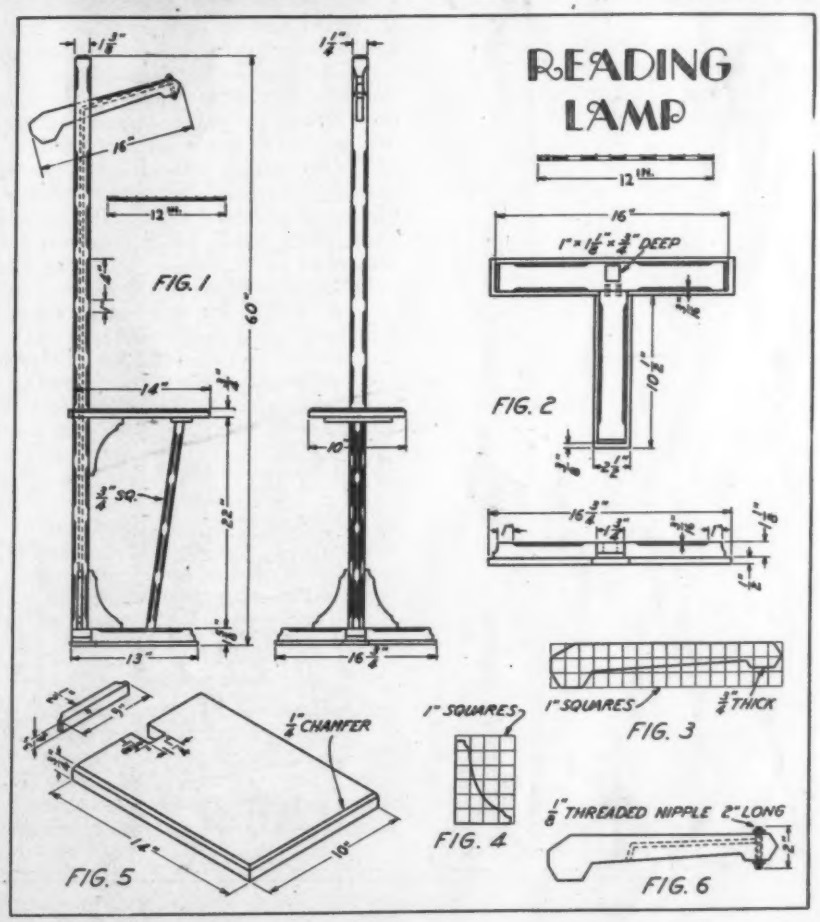
Figure 2 shows the construction of the base. The upper pieces of the base are held together with dowels and glue. The lower pieces are glued and screwed to the upper. The mortise, ¾ by 1 by 1⅛ in., cut into the top of the base takes the tenon of the same size on the lower end of the post.

Figure 3 shows the pattern for the arm. This is glued up of two pieces which have been gouged for the cord and then glued together.

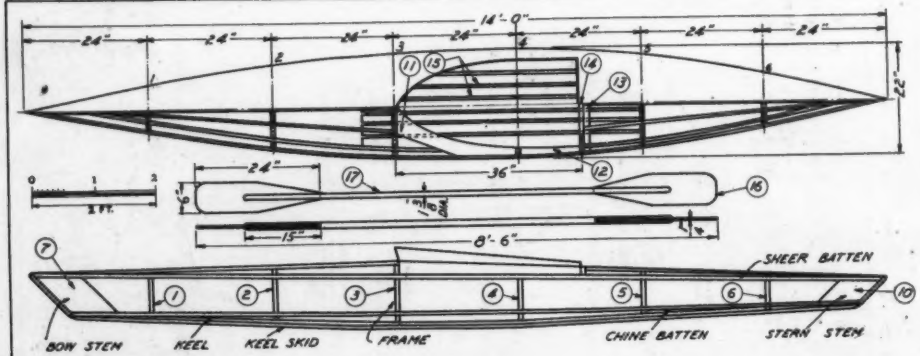
Figure 4 shows the design for the brackets. These are fastened to the post with short dowels and glue, and they are fastened to the base with long screws. The bracket which supports the shelf is fastened to the post with dowels and to the shelf with screws. The screw holes are plugged with a piece of dowel.

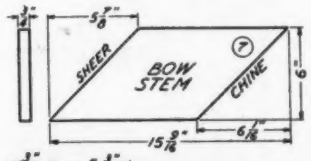
Figure 5 shows the construction of the shelf. The small strip at the back is put on after the lamp has been assembled and is fastened with glue and brads. The crosspiece on the under side of the shelf is of ½-in. material and serves to keep the shelf from warping. The support from the shelf to the base is fastened by means of a tenon which has been cut on either end. This is glued in place.

Figure 6 shows the method of attaching the lamp socket. The opening through the

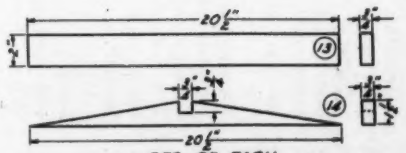


Kayak





1-REQ. OF EACH STEM



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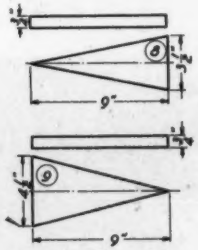

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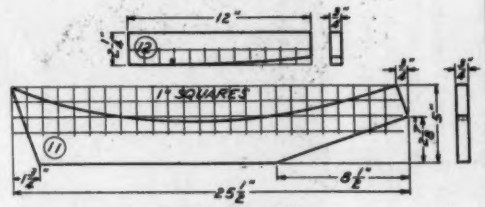

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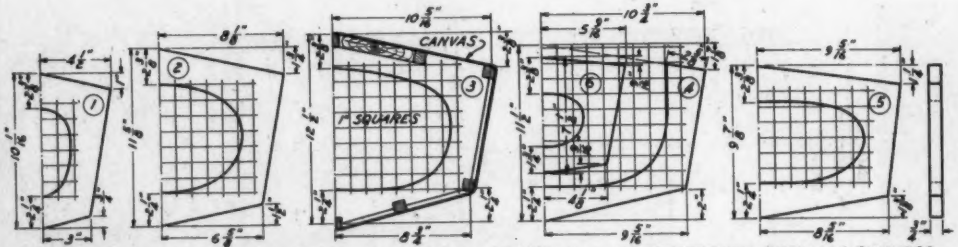
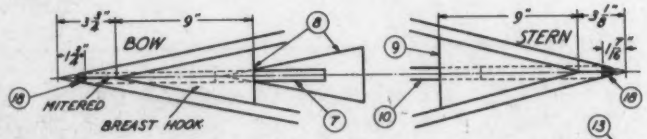
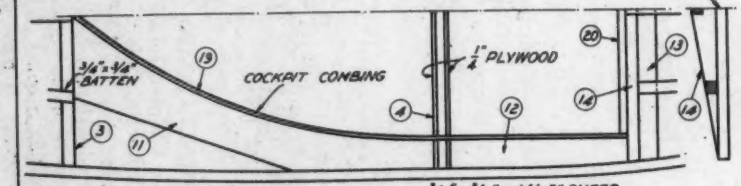
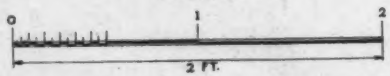


ALL FRAMES ARE NOTCHED TO RECEIVE BATTENS. FRAME No. 4 IS REINFORCED WITH ¼" PLYWOOD.
1-REQ. OF EACH

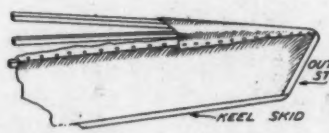




COCKPIT



USE CASEIN GLUE AND 1½" BRASS SCREWS TO FASTEN THESE PARTS TOGETHER. PARTS 9 AND 10 FASTEN THE SAME.



LUMBER		
NO.	REQ.	REMARKS
1 to 6	1	¾" × 12" × 8'-0" S.2S. STRAIGHT-GRAINED SPRUCE
4	1	¼" × 10" × 3'-8" OREGON PINE PLY
7 and 10	1	¾" × 6" × 2'-6" S.2S. STRAIGHT-GRAINED SPRUCE
8 and 9	1	¾" × 5" × 3'-0" S.2S. STRAIGHT-GRAINED SPRUCE
11	2	¾" × 5" × 2'-1½" S.2S. STRAIGHT-GRAINED SPRUCE
12	2	¾" × 2⅛" × 12" S.2S. STRAIGHT-GRAINED SPRUCE
13	1	¾" × 2" × 20½" S.2S. STRAIGHT-GRAINED SPRUCE
14	1	¾" × 1½" × 20½" S.2S. STRAIGHT-GRAINED SPRUCE
15	6	⅜" × 1¾" × 4'-6" S.4S. OREGON PINE
16	2	¼" × 6" × 24" OREGON PINE PLY
17	1	1⅜" DIA. × 7'-0" OREGON PINE
18	1	¾" × ¾" × 3'-0" S.4S. SPRUCE
19	2	¼" × 3" × 4'-4" S.4S. SPRUCE
20	1	⅜" × 3½" × 21" S.4S. SPRUCE
	2	¼" × ¾" × 16'-0" HALF ROUND REDWOOD FOR SHEER BEADS

HARDWARE
8 DOZ. 1½" No. 8 F.H. BRASS SCREWS
OR
2 LBS 7d GALVANIZED BOX NAILS
¾ LB. ⅝" 10-OZ. COPPER TACKS
1 LB. 3d GALV. HOT DIPPED FINISH NAILS
1 LB. CASEIN WATERPROOF GLUE
5 YDS. 48" 10-OZ. DOUBLE FILLED WHITE DUCK CANVAS
5 YDS. 29" 8-OZ. SINGLE FILLED WHITE DUCK CANVAS

PAINT
12½ LBS. TO-30 LEAD PASTE
¼ GAL. SATIN AUTO OIL CLEAR
1/16 GAL. PIGMENT GROUND IN OIL
¼ GAL. LESSCOAT
⅛ GAL. BOILED LINSEED OIL
¼ GAL. TURPENTINE
¼ GAL. LEAD MIXING OIL

I.A.U.E.

post for the arm should be cut at the same taper as that of the arm. The arm should be slanted about 15 deg. with the base. The stopped chamfers on the post, arm, and support are first marked and then cut out with a sharp chisel.

After all of the pieces have been cut out, they should be thoroughly sanded before the assembly is made. It is then ready to be stained and finished with shellac, varnish, or clear lacquer.

14-FOOT KAYAK

James McGregor, Pasadena, California

This kayak has been designed especially for boys of junior-high-school age, to meet the growing demand for life-size boats which are within the boys' ability. Before building one, a boy must present evidence of being a good swimmer and have the consent of his parents. This boat is designed for still waters, and not for ocean surf riding. It can be built in from 75 to 100 hours, depending on the ability of the boy. Straight-grained spruce is used. This wood bends easily without steaming.

Make two breast hooks No. 8, and two No. 9 for bow and stern. Mark out sheer battens to length and cut bevels at both ends to form a miter. Note that this is not a 45-deg. miter. Assemble sheer battens to breast hooks with casein glue and 1½-in. brass screws, bending the battens, bow fashion, with a 20½-in. spreader at the center. If desired, 7d galvanized box nails may be used in place of screws. Cut chine battens to length and bevels, and assemble to breast hooks, spreading the battens 17½ in. at the center. Do not cut off the sharp points of the miter joints at bow and stern meantime.

Lay out frames No. 1 to No. 6. All frames are notched to receive battens. Frame No. 4 is reinforced with ¼-in. plywood on both sides, and the band saw is used for cutting to shape and forming notches. Inside holes are cut on the jig saw.

Now take sheer and chine assemblies which already have the breast hooks fastened to them, and insert stems at bow and stern. The stems are fastened down through the breast hooks either with brass screws or galvanized nails. Note that stems are kept back from sharp point of bow and stern 1¾ in. and 1 7/16 in. respectively. These sharp points are cut off flush with stems afterward.

Mark out position of frames 24-in. centers measured in a straight line from bow to stern. Fit frame No. 4 in place and fasten with brass screws or 7d galvanized nails. Fit other frames in order 3, 2, 1, and 5, 6, beveling the notches at sheer and chine where necessary in order to make a good joint.

After the frames are all fastened at sheer and chine, put on bottom battens starting with the keel. Bevel ends of battens to fit on top of breast hooks.

The rear of cockpit is formed by piece No. 13 placed 12 in. forward from frame No. 5 and fastened between sheer battens. On top of this goes piece No. 14 to complete the slope of the deck.

The deck battens are now fitted and fastened into the notches of the frames. Fore-deck battens stop at frame No. 3 and aft ones at rear of cockpit.

The cockpit framing No. 11, 12, is fastened to frames 3, 4, and sheer battens. The curve on the cockpit should not be made too sharp, otherwise the combing is likely to break when bending. Floor boards are fastened to frames 3, 4, and 5, and if desired, a floor may be made of 3/8-in. plywood instead of slats.

After trimming sharp points at bow and stern in line with stems, round off the sheer and chine battens slightly where the canvas will touch. Apply one coat of lead paint to the completed assembly.

Canvas Covering

The 10-oz. canvas covers the bottom and sides of the kayak, the only seams being at bow and stern stems, where a little marine glue should be used to seal the joints tight. Roll the canvas out over the bottom of the boat and put a tack in each end. Turn boat right side up and pull up sides of canvas tight at frame No. 4, tacking on top edge of sheer batten first at one side of the boat and then at the other. Work from frame No. 4 to the bow and stern, pulling and tacking canvas tight, a little at a time. If the canvas is pulled in a vertical direction, fewer wrinkles will develop. Tacks are 1¼ in. apart along the top edge of sheer batten. After the tacking is completed, sponge canvas with water to shrink and take out small wrinkles, and if any remain, loosen necessary tacks and pull tighter. The deck canvas goes on easily and is tacked along the sheer batten and on the inside of the cockpit frame. A ¾-in. half-round molding covers the canvas seam at sheer, and a ¾ by ¾-in. piece covers seams at bow and stern. These trimmings are better put on after the painting has been done, likewise the combing round the cockpit and the keel skid.

The paddle is simply a piece of round pole with a slot in each end to receive the blades.

Painting

Good lead paint is recommended in preference to airplane dope. Airplane dope stretches the canvas so tight that there is a tendency for the boat to be pulled out of its proper form.

Specifications

One coat Lesscoat (this seals the pores of canvas).

Two coats 70–30 lead paste thinned with lead-mixing oil.

One to two coats satin auto oil clear, plus pigment ground in oil (2 to 3 lb. pigment to 1 gal.).

Suggested Color Schemes

Blue body, white deck
Green body, white deck
Green body, white and yellow deck
Black body, yellow deck
Red body, white deck
Yellow body, white deck

THE MORTISE-AND-TENON JOINT — V

John E. Doren, Eureka High School, Eureka, California

(Continued from page 351, November, 1935)

C. The Blind Mortise-and-Tenon Joint on Plain or Square-Edged Stock

The blind mortise-and-tenon joint is the most common type of mortise-and-tenon joint used today, and the reason is not hard to understand. Though the through mortise-and-tenon joint may be somewhat stronger, the cutting of the mortise is more difficult and consumes more time. The blind mortise is cut from one edge of the stock only, while the through mortise must be cut in from two opposite edges, necessitating double handling. When a mortise is cut entirely through a piece from one edge, the opposite edge is usually badly splintered when the mortising chisel cuts through.

The blind mortise-and-tenon joint gets its name from the fact that when the joint is assembled, both the mortise and the tenon are entirely concealed and the joint has the appearance of a butt joint as shown in Figures 11 and 12.

Wedges are sometimes used in connection with this joint to prevent the members from separating after the joint is once assembled regardless of whether glue is used or not. If

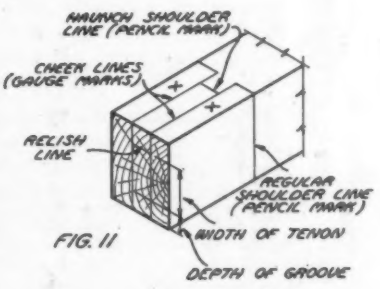


FIG. 11

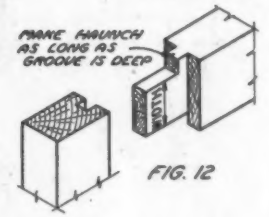


FIG. 12

wedges are to be used, both the mortise and the tenon must be prepared for them. The mortise must be lengthened at the bottom, or "under-cut" from 1/16 to ⅛ in. both ways, as shown in Figure 25.

The depth of the mortise should be approximately 1/16 in. greater than the length

of the tenon. If this is done, the tenon shoulder will make close contact with the mortised member. The mortise must also be clean and free of loose chips, for even one or two small loose chips in the mortise may prevent the shoulders from fitting as they should. The tenon should be slotted as shown in Figure 19. The slots should be from one half to two thirds the length of the tenon and should be placed from ⅛ to 3/16 in. from the edges.

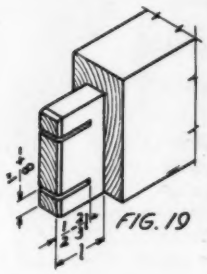


FIG. 19

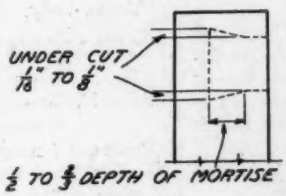


FIG. 25

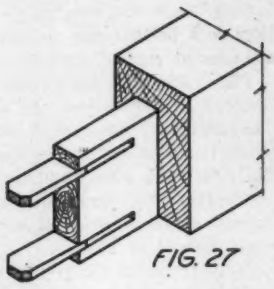


FIG. 27

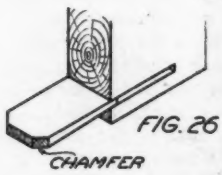


FIG. 26

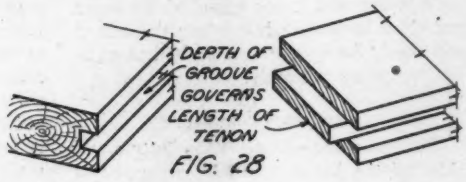


FIG. 28

The joint should be tested, that is, should be assembled without wedges or otherwise tested for dimension before it is finally assembled, for when it is once assembled with wedges, it will be impossible to pull it apart again.

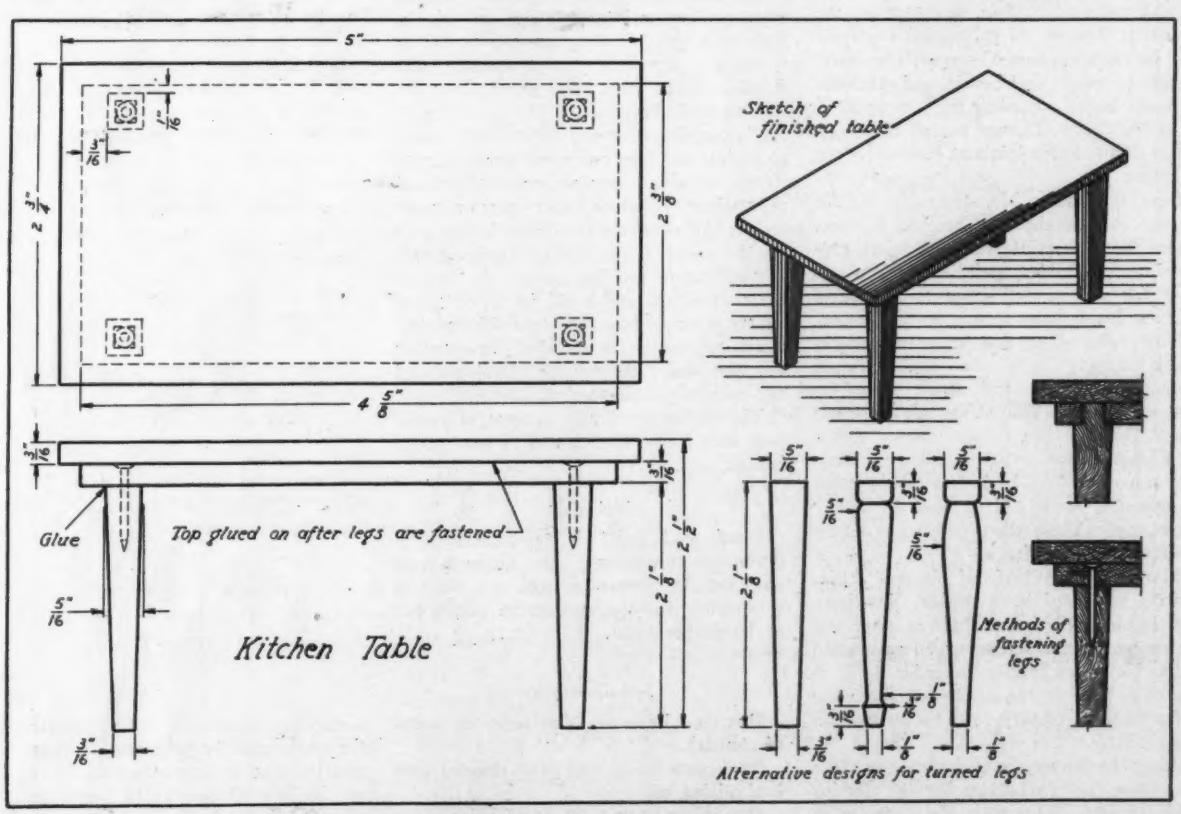
The wedges should be as long as the slots but they must not be longer. At the thin end, they should be just thick enough to fit snugly into the slots, and at the thick end they should be thick enough to expand the tenon to fill the mortise completely. The width of the wedges should be the same as the thickness of the tenons, and the corners should be chamfered as shown in Figure 26. The chamfered corners will permit the wedges to enter the mortise and slide to the bottom without catching. Sharp corners might catch on the walls of the mortise when the joint is being assembled, force the wedges into the slots and spread the tenon too soon. If this occurs, it may prevent the joint from closing properly and may even ruin the work.

To assemble the wedged joint, the wedges should be inserted in the slots to the depth of approximately ⅛ in. as shown in Figure 27. The glue is then applied to all faces of the mortise and tenon, and the two members are clamped together at once. When the wedges strike the bottom of the mortise they will be forced into the slots and so retain the tenon permanently in place.

The Stub Blind Tenon, Commonly Called the Stub Tenon. The stub tenon is a blind tenon and differs from the long blind tenon only in length. The length of the stub tenon is usually made approximately equal to its own thickness when no other factors enter into consideration, but when the stub tenon is used in connection with material that is grooved on the edges, the length of the tenon is determined by the depth of the groove. See Figure 28.

The thickness of the stub tenon is governed by the width of the groove.

(To be continued)



A dollhouse kitchen table. Peter Dillman and John J. Metz

(Continued on page 6A)

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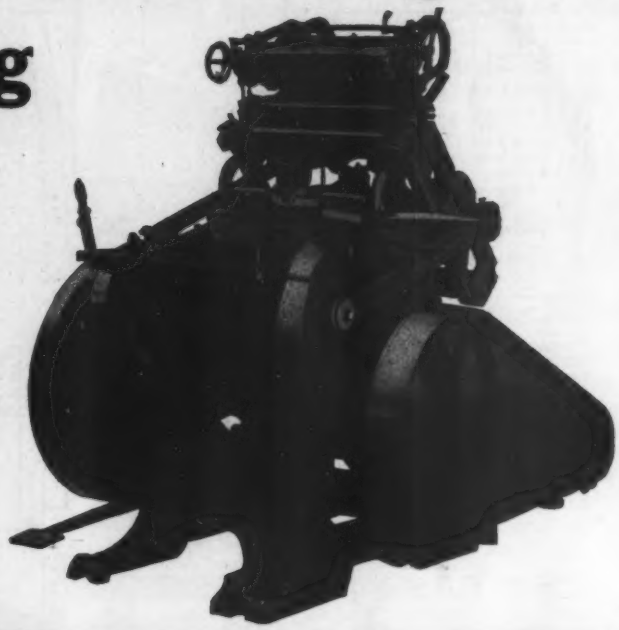

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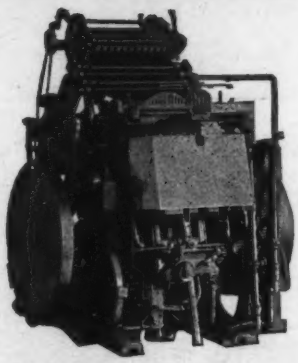

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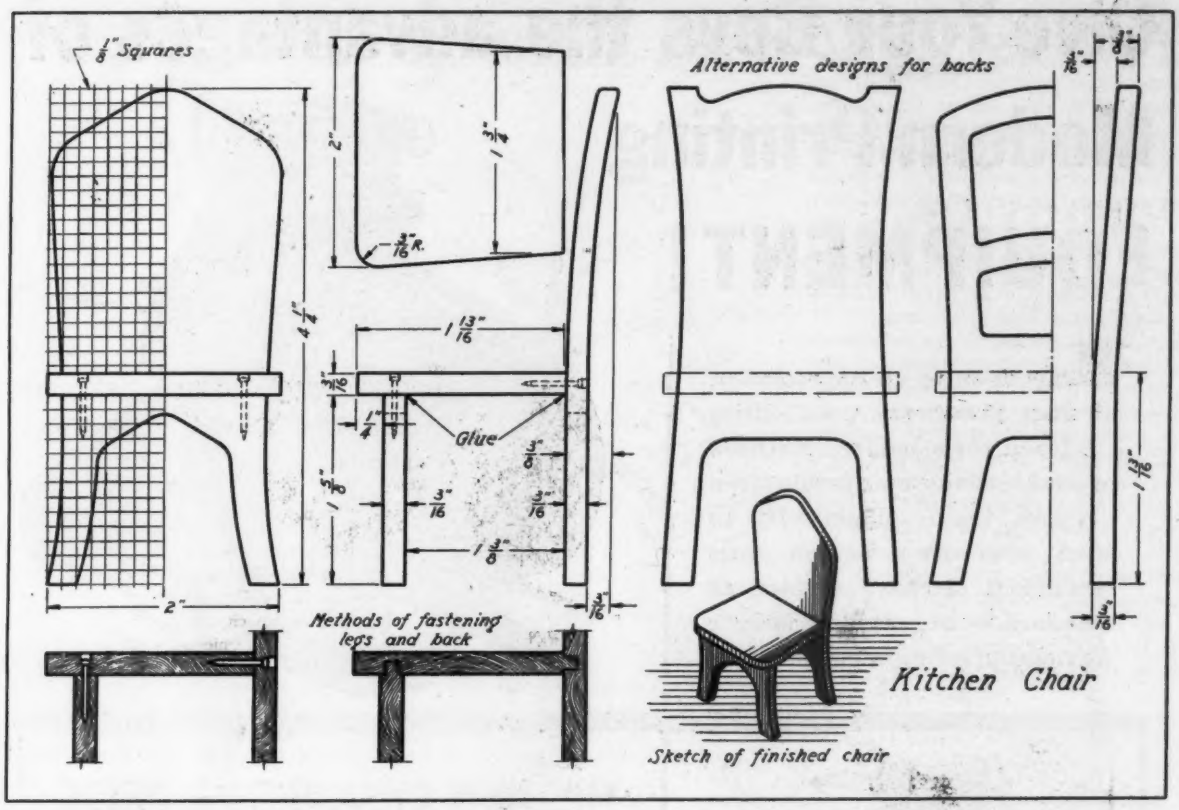
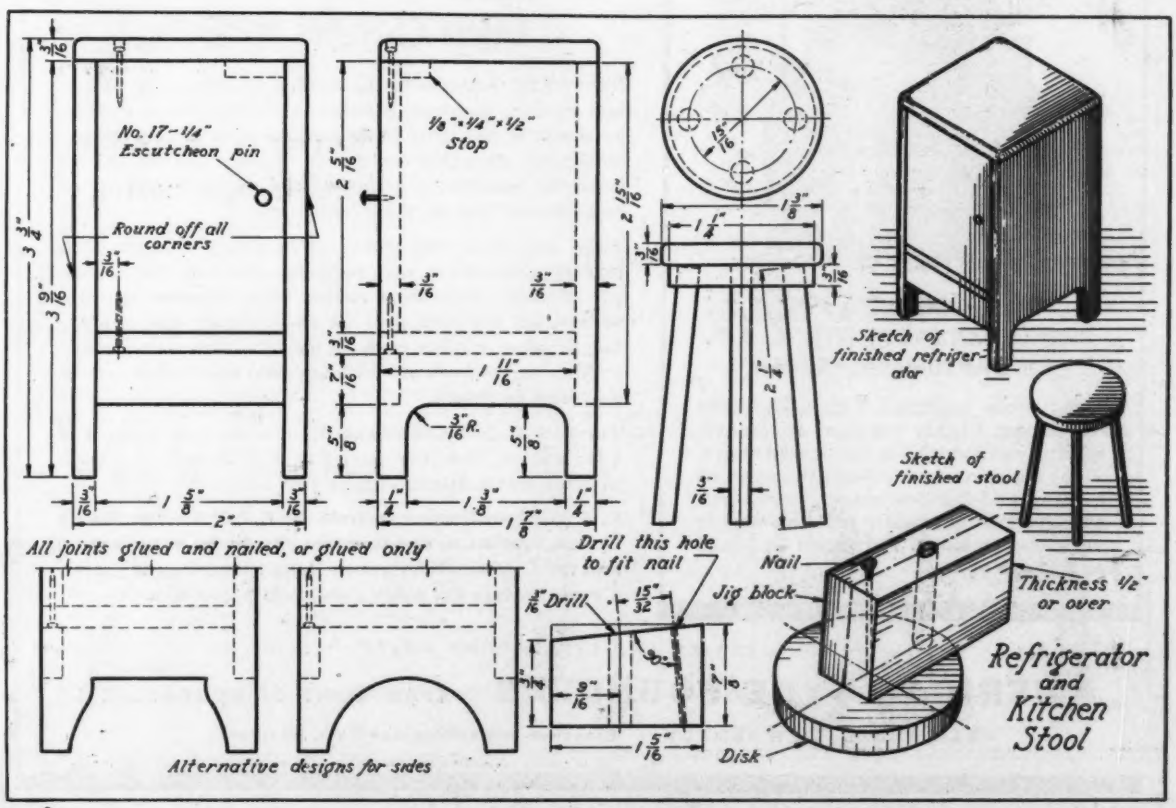
(Continued from page 32)





Dollhouse kitchen chairs, stool, and refrigerator. Peter Dillman and John J. Metz

(Continued on page 8A)

New 10-in. Circular Saw

Delta's Latest Quality Unit

An efficient, accurate well-guarded machine ideal for use in school woodworking shops.

Setting New Standards of Circular Saw Efficiency

Here it is—the long awaited 10-inch Delta Circular Saw—ready for delivery about December 20, 1935. When you read the detailed description of the numerous features of this remarkable tool—or better still, see it in action—you will agree it was worth while waiting for! Of course it embodies all the features that won so splendid a reputation for the Delta 8-inch saw—but in addition it is of greater capacity, with larger, heavier table—and with added conveniences. Cuts wood up to 3¼ in. thick. Rips to center of 48 in. panel with standard rip-gage bars. Crosscuts 12 in. boards on standard table—and has a full 12 in. table surface in front of blade. Has exceptionally heavy cast-iron table, 20 in. by 27 in. Has many special features including Delta "Micro-Set" Rip Gage, Auto-Set Miter gage with Automatic Stop, Self-Sealed Bearings oiled at factory for life of bearing, convenient ball-crank and worm-gear raising, lowering, and tilting, plus other features too numerous to mention. For full details write for 1936 Delta Catalog and Special Circular on 10-inch Circular Saw.

Write for latest Delta catalog and name of your nearest Delta dealer today.

The above illustration shows the new 10-inch Delta Circular Saw—mounted on a special Combination Unit with the Delta 6-inch Jointer. Circular Saw is available separately as a bench model, or mounted on special stand, or in combination as shown above.

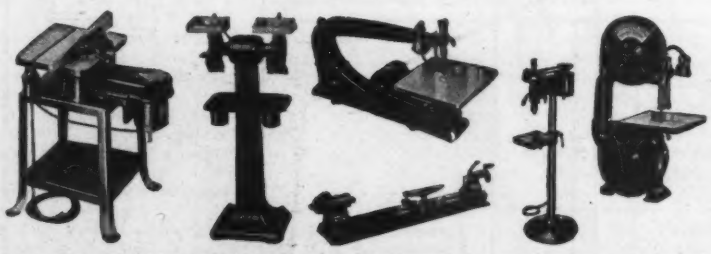
Write for New 1936 Catalog

It shows the complete Delta line of motor-driven tools. Explains their economy and efficiency. Describes the careful practical guarding system. Proves that these tools are splendidly adapted for school shop use.

Mail coupon without delay. Enclose only 10 cents at same time for Book No. 2 of Practical Delta Projects, 32 pages of new and novel things to make, with numerous blue prints, working drawings, photographs and illustrations—and complete directions for new projects.

New Shapers—New Grinders in 1936 "DELTA" Line

The new Delta Shaper is one of the simplest and yet most complete Shapers ever designed for the workshop. Has numerous basic improvements. The new Delta Grinders are not just another line of grinders—but revolutionary **new** grinders in every sense of the word! Belt-driven, motor-driven and pedestal models—they all embody Delta's high standards of designs and construction. No pains have been spared to make these new Delta Tools **ideal** in every way—convenient, safe, accurate and efficient. Truly, here are the grinders that shopworkers have always wanted—and at the unusually moderate Delta price levels.



Delta Manufacturing Co.
600-634 E. Vienna Ave.
Dept. (E136) Milwaukee, Wis.

If proof of Delta superiority were necessary for the craftsman who knows good tools, it would be afforded by the fact that the Delta Manufacturing Company is now the largest manufacturer in the world making this type of machinery exclusively.

DELTA MANUFACTURING COMPANY,
600-634 E. Vienna Ave., Dept. E136
MILWAUKEE, WISCONSIN

I enclose 10c (stamps or coin), for which please send me one copy of Book No. 2 "Practical Delta Projects." Also place me on your mailing list to receive 1936 Delta catalog of quality motor-driven woodworking tools.

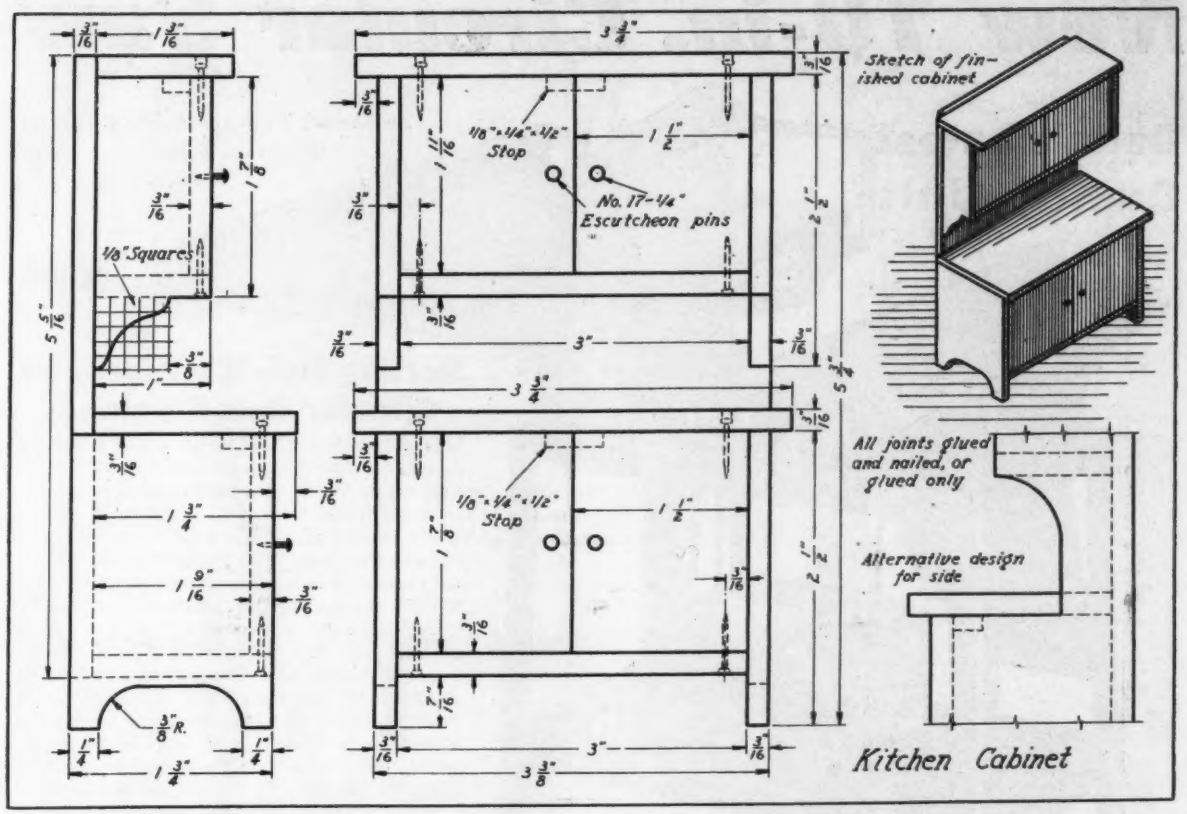
Name..... Age.....

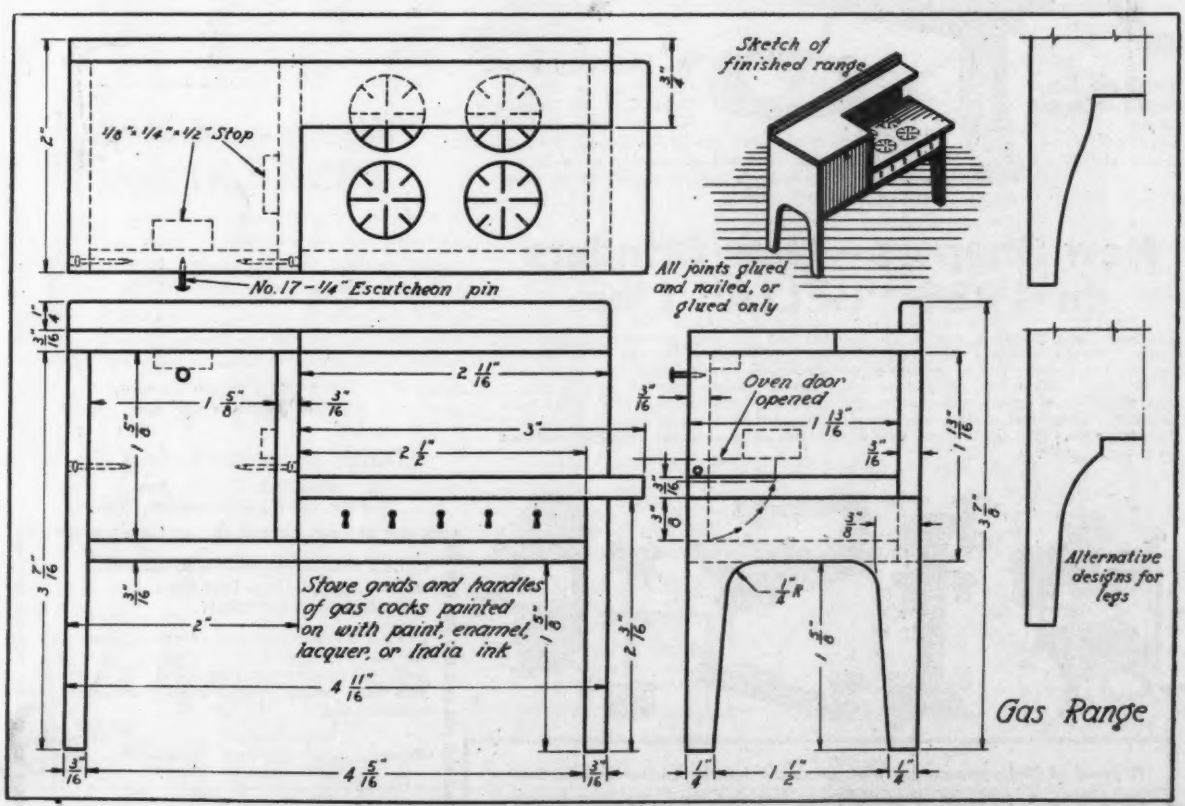
Address.....

City..... State.....

☐ Check here if you are a Delta user now.

(Continued from page 6A)

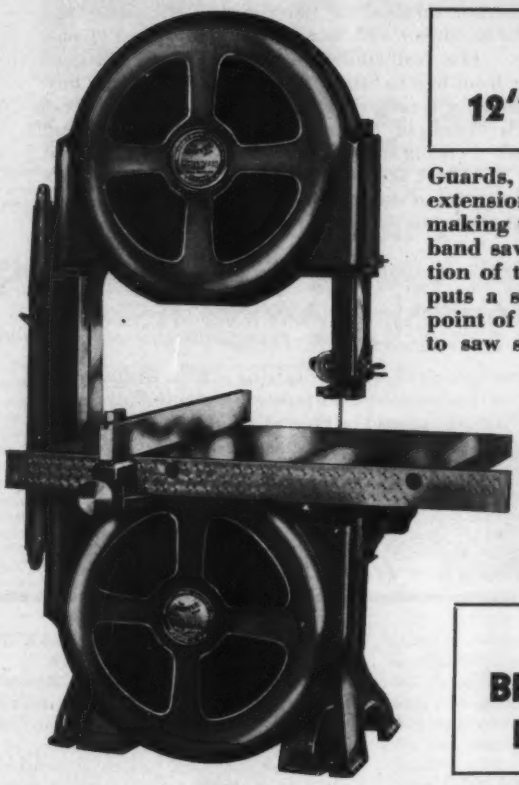



Sketch of finished range
1/8"×1/4"×1/2" Stop
No. 17-1/4" Escutcheon pin
All joints glued and nailed, or glued only
Oven door opened
Stove grids and handles of gas cocks painted on with paint, enamel, lacquer, or India ink
Alternative designs for legs
1/4" R
Gas Range

Dollhouse kitchen cabinet and gas range. Peter Dillman and John J. Metz

New DRIVER POWER TOOLS
Meet All School Shop Requirments

DRIVER TOOLS HAVE THE LATEST APPROVED SAFETY APPLIANCES



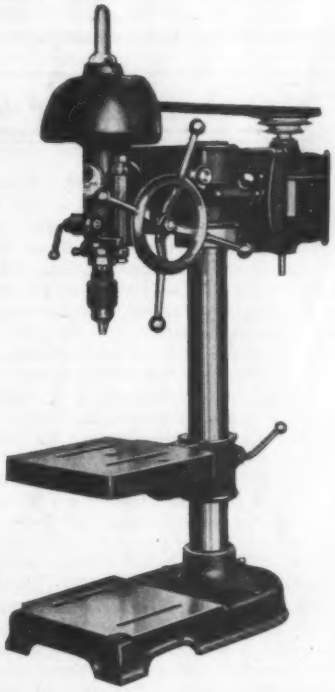
BN725 12" BAND SAW

Guards, ripping guide and table extension are regular equipment making this the most complete 12" band saw built. Reversing the position of the guide pins in the guide puts a slight twist in the blade at point of cutting, making it possible to saw stock of any length up to 4½" wide. The thrust of the saw blade is absorbed by SKF ball bearing guides, or blade supports above and below the table. An extra guard extending from upper wheel guard to the guide, moves with guide.

FEATURES

Wheels balanced and rubber faced.
6 SKF Ball Bearings.
Cast iron frame, tubular construction.
Diameter of disc wheels, 12".
Table tilts to 45° (geared control mechanism).
Table size 12½"x12" (with wood extensions 18"x12").
Ball bearing guide rollers (upper and and lower).
Opening small guard between upper and lower guards increases capacity above 12".
Height over all 33½".
Shipping weight 103 lbs.

D925 BENCH MODEL DRILL PRESS



Many new features and refinements makes the "900" Drill Press an ideal power tool for school shop use. A new six-splined spindle that reduces vibration to the lowest possible minimum. Four SKF Precision Ball Bearings for smoother performance. A larger column that gives stability. The availability of standard or slow speed pulleys, plus the universally accepted Jacob's Key Chuck—these are some of the characteristics which never before have been found in one drill press.

FEATURES

New 6-spline spindle. Spindle is ⅝" diameter, tapered at lower end for Jacob's Chuck.
4 SKF Precision ball bearings.
Jacob's (0 to ½") Key Chuck standard equipment.
Pilot wheel feed with calibrated depth stop.
Maximum distance chuck to table 12".
Maximum distance chuck to base (bench models) 17½".
Center of chuck to column 7½".
Table size 10"x9" adjustable to tilt at any angle. Base 10"x9".
Diameter of steel column 2¾".
Spindle travel 4".
Steel quill 1 1/16" diameter with teeth to match feed pinion milled into it.
Belt guard is an integral part of head. A cap over the exposed top end of spindle prevents any possibility of oil being thrown out and acts as a safety feature.
Improved locking device for holding spindle in any position.
Slow speed pulley available.
Speeds with standard pulley 600-1250-2440-5000 R.P.M. (with 1750 R.P.M. motor).
Speeds with slow speed pulley 480-940-1300-2900 R.P.M. (with 1750 R.P.M. motor). Lower speeds with 1150 R.P.M. motor.
Height over all 39½".
Shipping weight 125 lbs. (without motor).

Send for New 1936 Forty page Catalog.

WALKER-TURNER CO. INC. PLAINFIELD, N.J.

Walker-Turner Co. Inc.
816 Berckman St.
Plainfield, N. J.

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Address.....

City..... State.....

NOW *the time is ripe for tests! Use these industrial-arts tests to quickly and accurately evaluate your students and discover just what remedial work is necessary.*

INDUSTRIAL-ARTS TESTS
Test I, Woodwork

By Nash and Van Duzee

Designed to provide a reliable and accurate means of measuring acquired knowledge and skill in Woodworking. There is an Achievement and a Performance test.

Scale A (Achievement) Individual Set, 25 cents; Quantity Set, $1.25.

Scale B (Performance) Manual of Directions, 50 cents; Individual Set, 65 cents; Quantity Set, $1.10.

INDUSTRIAL-ARTS TESTS
Test II, Mechanical Drawing

By Nash and Van Duzee

This test may be used for measuring progress, for comparative purposes, for diagnostic and remedial purposes, as a partial basis for the assigning of school marks, and as an inventory test.

Individual Set, $1.50; Quantity Sets, Forms I and II, each $2.00.

MECHANICAL DRAWING PREFORMANCE TEST
By Earnest W. Baxter

Provides an objective method of determining the student's ability to visualize an object and to accurately represent it as a working drawing. The test consists of 24 problems, each of which will require from five to fifteen minutes for solution. Only the last four problems will require drawing instruments, the rest may be sketched freehand, or T square, triangles, and a drawing board may be used. Scoring sheets of tracing paper are provided for each problem . . . these are superimposed over the student's work allowing the teacher to score large numbers easily and quickly. The test conforms with the best methods in industrial-arts teaching.

Teacher's Set, 60 cents; Student's Set, 25 cents.

MECHANICAL DRAWING TEST
By Ferdinand A. P. Fischer

The five fundamental mechanical drawing units included in these tests (use of instruments, lettering, projected drawing, geometrical constructions, and pictorial representations) will reveal the strength or weakness of a class or individual in any one of them. Besides the tests, a manual for teachers, marking keys for each part, and a score sheet are provided.

Specimen Set—75 cents; Complete Set—$1.00.

BRUCE - MILWAUKEE

Association News

MINNESOTA SHOP TEACHERS ORGANIZE

The several groups of shop teachers in Minnesota, under the direction of H. T. Widdowson, state supervisor of industrial education, have organized regional associations for the purpose of holding annual professional and fellowship meetings.

Six of these groups have already organized, with the election of presiding officers. They are: Southeastern Minnesota, T. F. Richards, Winona; Central Minnesota, H. T. Thompson, Staples; Lake Minnetonka, A. R. Johnson, Wayzata; Northwestern Minnesota, C. W. Pope, Thief River Falls; Western Minnesota, L. R. North, Olivia; Southwestern Minnesota, H. R. Davidson, St. James.

MISSOURI INDUSTRIAL-ARTS TEACHERS MEET IN ST. LOUIS

The industrial-arts teachers of Missouri held a meeting in St. Louis, on November 7, in connection with the State Teachers' Association convention. The association had as its guest speaker, William L. Hunter, of the Iowa State College, who spoke on "The Future of Industrial Arts." Julius Tarling, of St. Louis, also gave a talk on "Standards in Mechanical Drafting."

Mr. Hunter spoke again at a dinner meeting at the Y.M.C.A., where he discussed "Home Workshops" before a group of seventy teachers.

Among the well-known industrial-education men in attendance were R. W. Selvidge, of Missouri University; George Hargitt and B. W. Noel, of St. Louis; C. A. Lamb, of Teachers' College, Cape Girardeau; and Ben Lieb, of Teachers' College, Kirksville, Mo.

WASHINGTON ASSOCIATION ORGANIZED

The industrial teachers of Washington held a special meeting during the summer to take action toward the organization of a central state association and to consider the needs of industrial education within the state.

Following the discussion, it was voted to organize a state association. Officers were elected, committees were appointed, and the group selected the name of the Washington Industrial-Education Association.

The purposes of the association, as laid down at its establishment, are "to unite all divisions of industrial education in the state, to encourage and promote industrial education, to co-operate with local, state, and national organizations for the promotion of industrial education, and to stimulate activity in industrial education."

The association has the co-operation of all branches of industrial education in the state, including industrial art, trade and industry, apprenticeship training, co-ordinators and placement, part time, day trade, extension departments, and rehabilitation.

The association has elected the following officers: president, E. P. Fait, Everett; vice-president, C. A. Steelsmith, Walla Walla; secretary-treasurer, A. H. Drews, Everett.—*A. H. Drews.*

WISCONSIN INDUSTRIAL-ARTS ASSOCIATION MEETS

The Wisconsin Industrial-Arts Association had its annual meeting under the chairmanship of V. M. Russell, Platteville, on Thursday, November 7, in the auditorium of the Girls' Technical High School, Milwaukee.

William L. Hunter, head of the department of industrial arts at the Iowa State College, Ames, Iowa, spoke on the subject of "Junior High School Industrial Arts and the Home Craft Movement." He emphasized the fact that industrial-arts teachers can learn much from the home crafter, and that by contacting these men the industrial-arts work in the school can gain much valuable publicity.

F. V. Powell, State Department of Public Instruction, Madison, spoke on "the changes in industrial-arts teaching."

C. A. Bowman, Dean of The Stout Institute and chairman of the committee on "The Industrial-Arts Curriculum" reported on the work and findings of this committee.

At the business meeting, the following officers were elected for the year 1936: President, R. A. Radtke, Milwaukee; vice-president, H. J. Shufelt, Racine; secretary-treasurer, Leo R. Ebben, Kohler; committeeman at large, T. A. Hippaka, Madison.

Following the business meeting, the club divided into several round-table sections to discuss their own problems.

At 6:15 p.m., Thursday, November 7, the industrial-arts teachers had a joint dinner meeting with the Wisconsin Vocational-Guidance Association, the Wisconsin High-School Principals, and the Industrial-Relations Asso-

(Continued on page 13A)

ADVERTISING PAGES REMOVED

Send for this **Special School Catalog**

SEND for this Catalog 34 of Stanley Tools. The new School Index suggests the proper equipment for Elementary, Junior High School, Senior High School and Vocational School Shops. You will find it helpful in making up your tool specifications.

STANLEY TOOLS

NEW BRITAIN, CONN.

Wallace PORTABLE MACHINES

6 in. and 8 in. JOINTERS

Takes heavy cut 8" wide, rabbets, ¾" deep. Circular safety cutter head contains 4 knives set at angle. Motors built in, directly connected by flexible coupling. High speed, production machines, portable, easily moved to suit the convenience of the operator. Also made in 6" size.

Standardize your school shops with WALLACE woodworking machines. Compact, safe, economical, built for years of hard service.

Write for our complete catalog

J. D. WALLACE & COMPANY 140 S. California Ave., Chicago, Ill.

MAKE EVERY STUDENT A

PLASTIC WOOD HANDY MAN

NOW EACH PUPIL CAN BECOME A HOME HANDY MAN BY USING THIS NEW DISCOVERY — WOOD IN CANS AND TUBES

You undoubtedly have pupils in every class who will never be able to handle tools or build things in a hundred years. Yet these pupils can be taught how to become a tolerable "Handy Man" around the house with the aid of Plastic Wood. The parents of these pupils—knowing the inaptitude of their children—would be pleasantly surprised to find out that they could reset loose drawer pulls, casters, bathroom fixtures, repair damaged furniture, seal cracks, fill enlarged screw and nail holes, replace rotted wood—with Plastic Wood. If you believe this practical home repair knowledge would be useful material to teach, write The A. S. Boyle Company, (Inc.), 1934 Dana Ave., Cincinnati, Ohio, for 48 page book of interesting and instructive data.

COMPARE RESULTS

obtained with Gardiner Flux-Filled Solder with the work done with any other brand. The uniform high quality insures neater, faster work and stronger bonds.

In addition, Gardiner Solder, due to modern production methods, actually costs less than ordinary solders.

Packed in 1, 5 & 20 lb. spools, also in handy household tins

Ask for it by name at hardware and mill supply dealers. We will send a generous sample upon request.

Gardiner METAL CO.

4822 So. Campbell Ave., Chicago, Ill.

(Continued from page 10A)

ciation. At this meeting, State Supervisor John Callahan spoke on "Public Education and Its Relation to Public and Industrial Life."

WESTCHESTER INDUSTRIAL-ARTS ASSOCIATION MEETS IN YONKERS, NEW YORK

The first meeting of the Westchester Industrial-Arts Association for the current year was held in October, in the Franklin High School, Yonkers, N. Y. More than fifty men interested in industrial-arts work were present. Among those present were Superintendent Lamont Hodge, of Yonkers, and Assistant Superintendent N. Morisette.

The meeting marked the twenty-fifth school-shop visit of the club. Mr. Herman Hjorth, of the Saunders Trade School, gave an instructive talk on "The Use of Veneer," in which he gave the results of his experience in the field of industrial arts.

The meeting, which was in charge of Mr. Wilbur Robinson of White Plains, was conceded to be one of the best the club has had. —*E. W. Manzer.*

WISCONSIN VOCATIONAL ASSOCIATION MEETS

The Wisconsin Vocational Association held its annual meeting at a 12 o'clock luncheon on Thursday, November 7, in the gold room of the Hotel Wisconsin. The speaker on this occasion was the Honorable Philip LaFollette, governor of the state.

The following officers were elected for the coming year: President, West Burdick, Madison; secretary-treasurer, Jacob Spies, Sheboygan; vice-presidents: commercial, Cora Nelson, Racine; co-ordination, Elizabeth Geve, Fond du Lac; directors, Harley Brook, Eau Claire; general subject, R. H. Langdon, La Crosse; home economics, Ann Roach, Wisconsin Rapids; rehabilitation, John Lasher, Milwaukee; teacher training, H. C. Thayer, Madison; trade and industry, V. E. Anderson, Watertown.

New Publications

Cold Metalwork Notebook

By Geo. A. Willoughby and Duane G. Chamberlain. Paper, 4½ by 6, 48 pages, illustrated. Price, 20 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

This useful booklet contains the essential information and descriptions of processes necessary in the construction of typical cold-metal projects. It contains concise and clear explanations about tools, materials, methods of forming, fastening, shaping, and finishing projects made of metal. It also contains sketches of a number of things that the student or home craftsman can make.

Mechanical Drawing Performance Test

By Ernest W. Baxter. Price: teacher's set, 60 cents; student's set, 25 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

This test consists of 24 problems printed on squared paper so that the student can make front, top, and end views of each problem, either by the freehand-sketching method, or he may use T square, triangles, and drawing board if the teacher so desires. The tests may be used either individually or with groups, and they may be given two or more problems at a time. The student's set consists of a sheet giving directions to the student and a sample drawing, together with the 24 problems. The teacher's set consists of a student's set plus a set of 24 scoring sheets on tracing paper which will permit the rapid checking of the student's work. Teacher's set also contains the directions for administering the test.

Practical Shop Mathematics

By John H. Wolfe and Everett R. Phelps. Cloth, 5 by 8. Vol. I, elementary, 322 pages; Vol. II, advanced, 296 pages. Price, $2.20 each. Published by The McGraw-Hill Book Company, 330 West 42nd Street, New York City.

Volume I starts with common fractions, goes through decimals, square root, the use of micrometers, verniers, bevel protractors, the use of formulas, ratio and proportion, percentage, taper per foot, practical geometry and trigonometry. It also contains a table of the natural trigonometric functions.

The advanced book takes up the study of compound angles and their application, screw threads, the different types of gears, gear ratios and lead screws, planetary gearing, plain and differential indexing, combining fractions and continued fractions. Both books are well illustrated and contain a fine selection of real problems such as are found by the machinist and toolmaker in industrial plants.

The School Shop Shopping Guide

KNIVES OF QUALITY

For Sloyd and Manual Training work, there are no finer knives made than Robert Murphy's.

Over 85 years of experience, research and experimentation enable us to offer knives of guaranteed quality. Every blade is especially processed of the finest steel to stand the gaff of school shop use and STAY SHARP.

Write for a complete catalog

ROBERT MURPHY'S SONS CO.
AYER, Established 1850 MASS.

PROBLEMS for SCHOOL and HOME WORKSHOP

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Simple, practical problems which develop interest and skill. 50 cents

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BRASS and ALUMINUM SHAPES

For Model Building. Dioramic Displays. Structural Designs.

The only material of its kind. Available in any length up to ten feet. Precision correct to 5-1000 inch.

Essential for all types of Model Work. Bridges, Towers, Structures, Aquariums, Novelties, Jewelry cases, Ships and Miniature displays. Send only 25 cents in coin or stamps for 12 one inch samples (each different) and illustrated price folder—or price folder free.

METAL FURROWING WORKS
550 WEBSTER AVE. CHICAGO, ILL.

RHODES COMBINATION

7-Inch Shaper and 3½-Inch Slotter

1. A precision Tool. 2. Capacity for average work. 3. Small floor space and power requirements. 4. Exceptional instructional value. *Write for details*

THE RHODES MFG. CO.
Waltham, Mass.

THE BEMIS VISE

For New Schools or Replacements in Old Ones

Patented in August 1912 and since that time the Standard in an increasing number of school shops.

Write for circular and prices

A. L. BEMIS 68 Commercial Street Worcester, Mass.

PEWTERCRAFT

The New Industrial Art Subject

Special offer

15 teaching aid sheets 75 cents (coin or stamps) Start this new work. Send for circular, and reprint on Pewtercraft 10c.

THE PEWTERCRAFTER
29 Meadow E. W. MANZER Bronxville, N. Y.

CASTINGS

and Blue Prints to Build a large variety of fine HOME WORKSHOP MACHINES in the school shop. Castings made to order. Send for free catalog.

DESIGNERS COMPANY
724 Munroe Ave. RACINE, WIS.

LEATHERCRAFT

Our Leathercraft Catalog, showing many interesting and useful articles for the leathercraft class, is now ready.

Leather - Lacing - Tools - Patterns, etc.

Ask for catalog "M"

OSBORN BROS., 223 Jackson Blvd., Chicago

AUTOMATIC OILSTONE

New device makes easy an accurate bevel, perfect edges. Aluminum and bronze, beautifully finished. Coarse and fine in one reversible oilstone; micrometer adjustment; ball bearing. $5 postpaid. Send check for immediate shipment, and dealer's name if he cannot supply. Money back if not satisfied. Ask for descriptive folder.

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100 Middlesex Avenue Somerville, Mass.

THE INDIANHEAD ARCHERY & MFG. CO.

of Lima, Ohio

extends its best wishes to you for a Merry Christmas and a Prosperous New Year.

Our new folder now ready. Ask for your copy.

COLUMBIAN VISES

The complete "Columbian" line includes vises of every style and size for wood and metal work. Also drop forged steel "C" Clamps.

THE COLUMBIAN VISE & MFG. CO.
"World's Largest Makers of Vises"
9017 Bessemer Ave. Cleveland, Ohio

WALNUT

The O'BRIEN LUMBER CO.
2655 S. ROBEY ST., CHICAGO

Operating our own kilns assures you of dryness. Deal with a house known a half century for Quality and Service.

DOMESTIC HARDWOODS
MAHOGANY

T. A. Foley Lumber Co.

We Furnish Schools With

Lumber, Panels, Dowels and Cedar Chests

PARIS, ILLINOIS

LUMBER—PLYWOOD

SQUARES

"PAXTON"

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DOWELS

FRANK PAXTON LUMBER CO.
Kansas City, Kansas - Denver, Colorado

CHEST SETS

INDUSTRIAL FURNACES and BURNERS

for every requirement

Oven Furnaces, Pot Furnaces, Blowpipes, Melters, Complete Tables, etc.

Write for complete information.

American Gas Furnace Co.
ELIZABETH, N. J.

SHOP SUPPLIES

TOOLS AND MACHINERY

Headquarters for School Woodworking Equipment

Large and complete stock of woodworking machinery, tools and supplies. (Also good bargains in rebuilt machines.) *Knife grinding and saw filing a specialty*—quick service. Complete shop for expert machinery and tool repairs—satisfaction guaranteed. Write for catalog.

WOODWORKERS' TOOL WORKS
224 S. Jefferson St. Chicago, Ill.

School-Shop Equipment News

ATKINS HOLE SAW

The E. C. Atkins Company, Indianapolis, Ind., manufacturers of saws, saw tools, and specialties, is offering a new hole saw for use by plumbers, electricians, automobile mechanics, sheet-metal workers, and woodworkers.

The Atkins hole saw, which also is suitable for use in school shops, is equipped with steel blades which are capable of cutting either wood or metal. It will cut holes and plugs in all types of material. The main feature of the saw is the blade, which is instantly replaceable in a permanent sawholder, and eliminates the necessity of discarding the holder when only the blade is worn out. The saws are made in two types — No. 2, ½ in. in diameter, and No. 3, ¼ in. in diameter, both of which fit any diameter of holder or blade. The holders, or heads, are also made in two sizes — No. 4 for use with a ¼-in. center drill for hole guide, and No. 5 for use with a drill jig.

Complete information and prices may be obtained by any shop instructor upon request.

NEW SOUTH BEND LATHE PAMPHLET

The South Bend Lathe Works, South Bend, Ind., have just issued a pamphlet under the name of *Interesting Installation of South Bend Lathes*. The illustrations which show the widespread special uses made of the lathes manufactured by this firm are exceedingly interesting. Copies of the pamphlet may be had upon request.

HIGGINS' MECHANICAL-DRAWING CONTEST

Charles M. Higgins & Company, Inc., of Brooklyn, N. Y., have announced their forthcoming national contest in mechanical drawing. The contest has been planned particularly for students in American high and vocational schools by J. H. Constantine, director of vocational education in Passaic, N. J., and one of the leading authorities in this particular work.

The contest is open to all students in recognized high or vocational schools of the United States. A special eight-page brochure has been issued by the firm, containing typical projects and rules governing the contest, which closes on March 15.

The firm offers four different prizes for the best projects in mechanical drawing. These are:

Project I — First prize, $20, and five honorable-mention awards, each consisting of a set of twelve bottles of Higgins' colored drawing inks.

Project II — First prize, $20, and five honorable-mention awards, each consisting of a set of twelve bottles of Higgins' ink.

Project III — First prize, $25, and five honorable-mention awards, each consisting of a set of twelve bottles of Higgins' ink.

Project IV — First prize, $25, and five honorable-mention awards, each consisting of a set of twelve bottles of Higgins' ink.

NEW CATALOG OF POWER AND HAND TOOLS

The Snap-on-Tools Company, Inc., of Kenosha, Wis., has issued its new catalog 35-P for 1935, listing and describing its complete line of power and hand wrenches and hand tools for school shops.

The catalog lists midget hexagon sockets, T handles, ferret single- and double-broached hexagon sockets, power universal joints, square impact sockets, hexagon impact sockets, socket-wrench drivers, screw-driver shanks, electric-motor shanks, power-socket adaptors, master T handles, heavy-duty T handles, assembly T handles, speeder handles, ferret ratcheting speeders, refrigeration service tools, special tools for refrigeration production and service work, special tools for radio production and service work, chisels and punches.

A copy of the catalog will be sent to any shop instructor upon request.

LEATHERCRAFTERS—

We supply everything needed for this fascinating work. Largest assortment of materials at lowest prices. Samples FREE to teachers, camp instructors, etc., who write for same on official letterhead or give connections. Others

SEND FOR SAMPLES ENCLOSE 5 CENTS in Stamps

ART LEATHERS FOR THE LEATHERCRAFT WORKER

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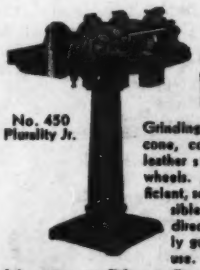

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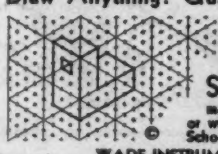

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